WIRE AND WIRE PRODUCTS

DECEMBER 1943

ARE THEY HELPING TO *Win the war?*

YES!

By Increasing the Output of finished wire (high or low carbon stock) drawn to exacting specifications.

By Increasing Plant Capacity: compact design — more production per square foot of floor space.

By Conserving Man Power: greater output per operator through continuous wire drawing with ease of control and adequate safety features.

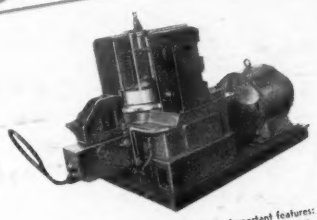
By Conserving Power. Efficiency here is also a matter of design: improved drives, less friction, less needless weight.

By Reducing Maintenance Costs. Morgan Wire Machinery is built with generous margins of safety to insure peak-load-operation with minimum time out.

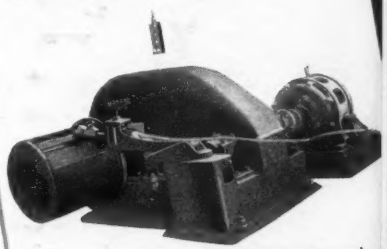
* * *

Yes . . Morgan Wire Machinery is in there helping — and can also be a big asset to you on V-Day, when the old battle for business will start all over again.

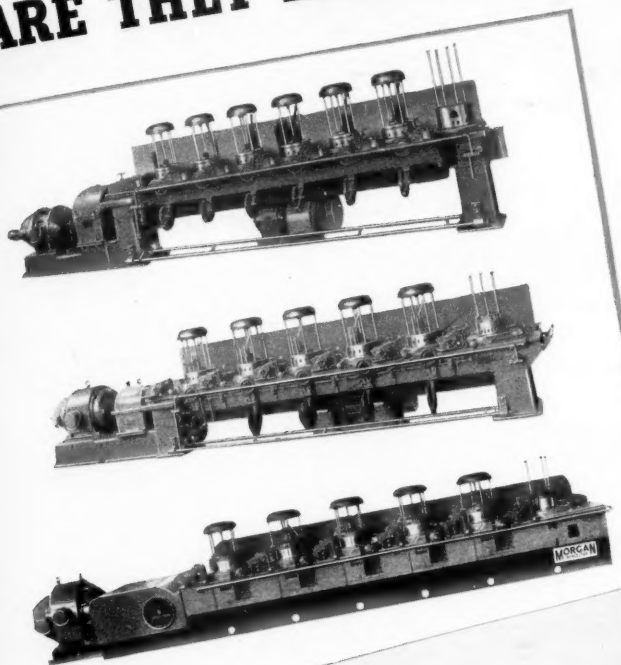
MORGAN CONSTRUCTION COMPANY
WORCESTER, MASSACHUSETTS.

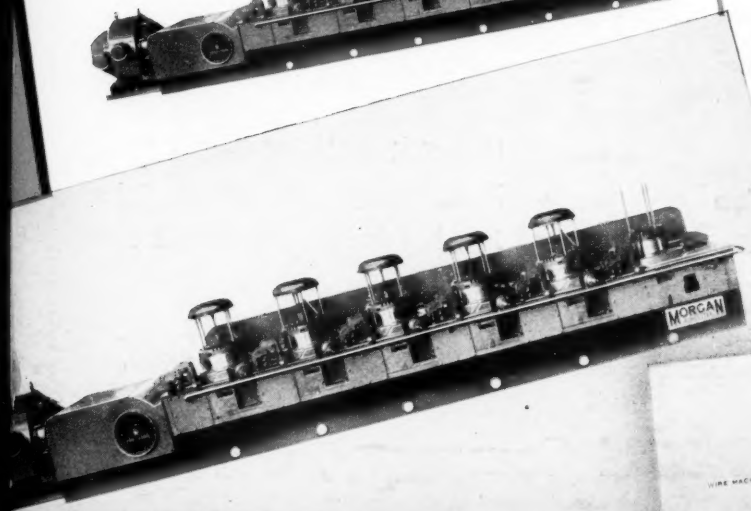


Morgan Vertical Spindle Wire Blocks offer important features: Single and double deck blocks; interchangeable blocks; die boxes fully adjustable for horizontal or vertical cast and equipped to receive all common sizes of die holders. Each machine is unit powered, and driven by combination spiral bevel and helical gears that give high efficiency at all ratios. Air-cooled blocks embody new patented fin-type construction which aids in dissipating heat. Modern safety devices.



Morgan Horizontal Bull Block, Type 105, handles cold drawn round stock one inch or less diameter and equivalent sections in other shapes. The outstanding feature is the speed with which a finished bundle can be stripped from the horizontal block. Smooth, quiet and dependable. High carbon steel gears with cut teeth run in a bath of oil. Shaft bearings are roller type throughout.



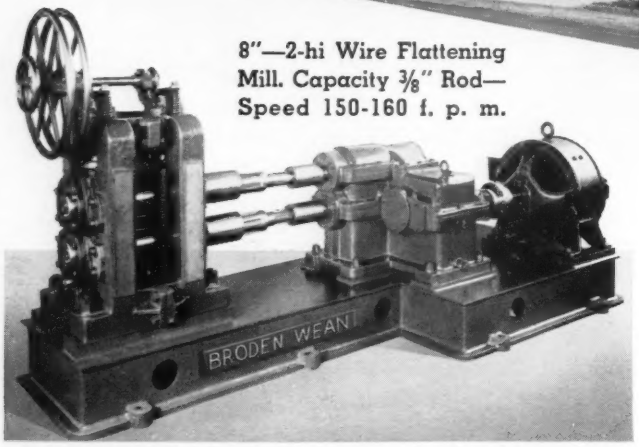


MORGAN CONSTRUCTION COMPANY
ENGINEERS AND MANUFACTURERS
ROLLING MILLS · WIRE MACHINERY · GAS PRODUCERS · COMBUSTION CONTROLS
WORCESTER, MASSACHUSETTS, U.S.A.
WIRE MACHINERY DEPARTMENT
2 BELMONT STREET
CABLE MORGAN
Postal District 5
1 December 1943

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

BRODEN

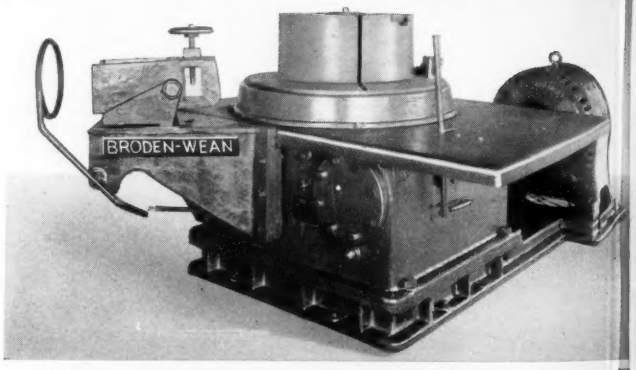
Specializes in Narrow Strip and Wire Mill Equipment



8"—2-hi Wire Flattening Mill. Capacity 3/8" Rod—Speed 150-160 f. p. m.

THE Wean Engineering Company, Inc., have long been recognized as Specialists in sheet, strip and tin mill equipment . . . The Broden Construction Company specializes in the manufacture of narrow strip and wire mill equipment.

With the extended facilities of The Broden Construction Company as a subsidiary of The Wean Engineering Company, Inc., it is now possible to serve the steel industry more effectively.

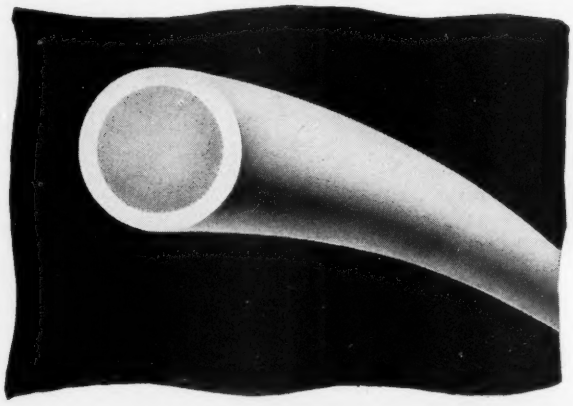


Special Alloy Single Draft Heavy Duty Vertical Wire Drawing Block for 5/8" Round Rod.

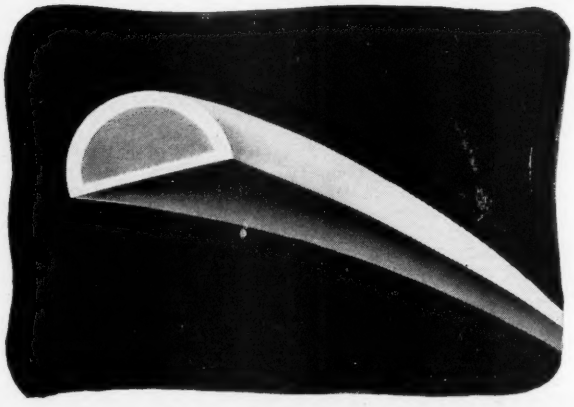
The BRODEN CONSTRUCTION Company, Cleveland, O.

The WEAN ENGINEERING Company, Inc., Warren, O.

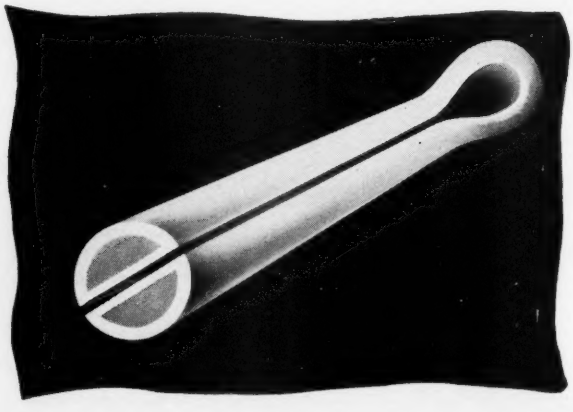
BETHANIZED WIRE . . .



is rolled into this shape



then formed into a cotter pin



without harming the zinc coating

Don't underestimate the humble cotter pin. We're using almost as many of them in this war as bullets. They're keeping vital nuts locked in place on high-speed engines and other parts of planes, tanks, jeeps, trucks, ships.

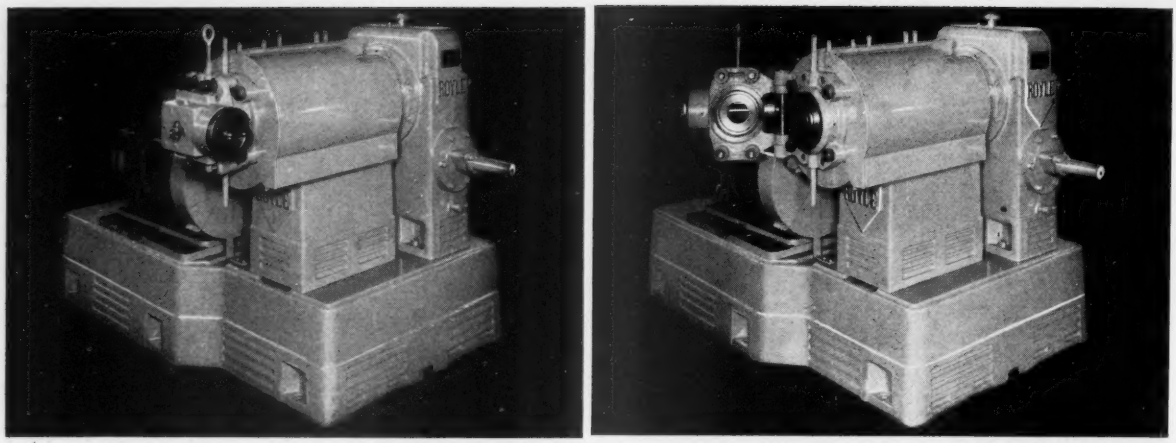
This is another big job that bethanized wire is doing in the war.

The manufacturer simply takes a coil of special steel bethanized wire, rolls it into a half-round, and then proceeds to pour out cotter pins from his finishing machine. The bethanized zinc coating sticks on—tight, sound, and uniform—throughout the whole series of operations. The result is that these vital pins can be turned out faster, and better, and still stand up perfectly to the test of combat.

The secret is the bethanized coating. The zinc is applied to the wire by an electric current. In bethanizing wire no zinc metal is used; the zinc coating is electrolized directly from zinc ore. It is 99.9+ per cent pure, ductile as gold leaf, and absolutely uniform both *along* and *around* the wire. Bethanized wire can be coiled around its own diameter, bent flat back upon itself, or drawn to 1-10th its size—without harming the coating.

If you are doing war work with zinc-coated wire, investigate the possibility of using bethanized.

That's why the bethanized coating withstands the severe operations involved in cotter-pin manufacture. It explains, in fact, why many products which heretofore were thought impossible for zinc-coated wire are now being made successfully of bethanized.



NO. 2 ROYLE PLASTICS INSULATING MACHINE

"ANY INSULATION" WON'T DO WHEN YOU'RE FIGHTING A GLOBAL WAR...

The long felt need for insulating materials possessing properties not found in rubber skyrocketed as the war spread to all quarters of the globe. This was a need that had to be filled almost overnight. Delays meant the needless loss of precious lives — stymied campaigns — prolonging the war.

The ingenuity and experience of the chemical industry and wire processors had developed suitable materials for plastics insulation. John Royle & Sons—progressive pioneers since 1880 in the manufacture of extrusion machinery—were called upon to produce the necessary equipment for processing plastics insulation.

Today Royle Continuous Resin Insulating Machines are delivering plastics insulated wire in many of the nation's wire processing plants—"enough and on time".

More general applications of the Royle Continuous Resin Insulating Machine are manifesting themselves. The horizon is bright, but that must wait until the war has been won.

JOHN ROYLE & SONS

ROYLE PATERSON N. J.

PIONEER BUILDERS OF EXTRUSION MACHINES SINCE 1880

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JAMES DAY (MACHINERY) LTD.

They Don't Look Alike
They Don't Grind Alike

But there is a place for each

THE difference is in structure. Briefly speaking, you need the structure that's best for your jobs.

The wheel at the left, for example, is the Norton Open Structure Wheel. Its large pores make it especially adaptable for jobs requiring comparatively heavy stock removal or extra coolness of cut, or both. Typical examples are surface grinding, hob grinding, formed tool grinding, gear grinding, and internal grinding.

An illustrated folder gives full information. Write for a copy.

NORTON COMPANY, WORCESTER, MASS.

New York Chicago Detroit Philadelphia Pittsburgh
Hartford Cleveland Hamilton, Ont.

W-919A

NORTON ABRASIVES

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FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

In the time of the Revolution, our colonial furnaces produced 30,000 tons of iron a year. Out of this tonnage, General Washington armed his troops and won our freedom.

★ ★ ★

In this war of the world . . . America is producing more than 90 million tons of steel ingots a year — more than all of the rest of the world combined — with virtually every ton going into fighting steels for our fighting men.

★ ★ ★

Such is the measure of the growth of our iron and steel industry in the years of our Republic. And the very growth of our country has been written in the fiery chapters of steel's expansion . . . for it is steel that built our industries, our railroads, our highways, our towns and cities, and knit this continent into a community by the development of our rich resources. So we have enjoyed our freedom . . . and by enterprise, ingenuity, science, and skill created a way of life and living that is American.

★ ★ ★

Holding fast to this freedom—securing it anew for the brave, new era that lies ahead for America —is now the measure of steel's productivity in overwhelming quantity as it serves directly on all fronts and helps to marshal other materials and metals for military duty.

★ ★ ★

First of our fighting metals . . . steel is likewise the strongest, most serviceable, adaptable metal for the peaceful arts. It is in this role that steel looks to the future, for this war that has sharpened steel's fighting tools has also put a keen edge on its ambition and ability to create new things for a new world of peace and progress and prosperity.

★ ★ ★

With steel we measure our freedom . . . secure it . . . defend it . . . share it with all mankind.

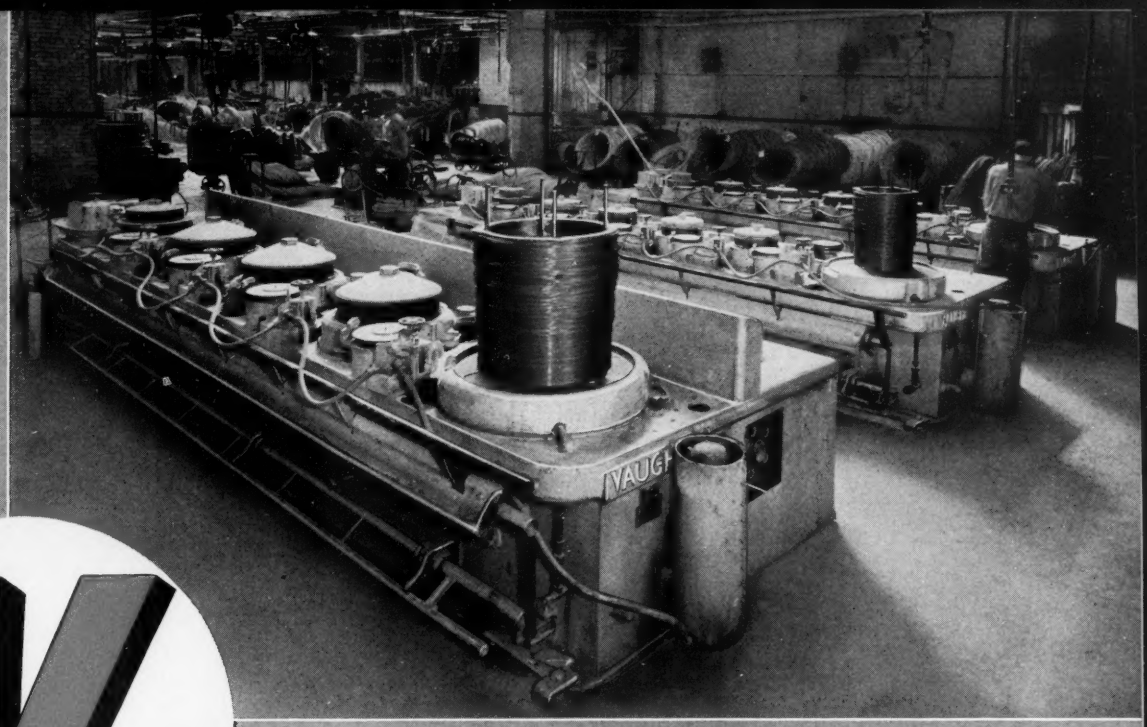
JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

J&L STEEL

CONTROLLED QUALITY STEEL FOR WAR

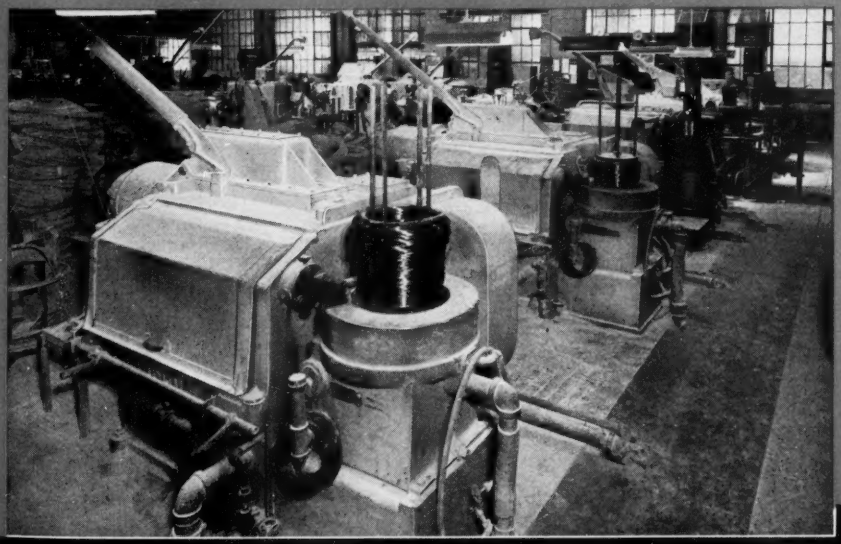
Industrial scrap helps win the war... keep your scrap moving to the steel mills.



VAUGHN

WIRE DRAWING MACHINERY

Speeds wire production where every minute counts!



CARRYING a heavy share of the war production load for America and the United Nations, the wire drawing industry lives up to its responsibility in full. We are proud that Vaughn Machinery's speed and dependable performance are indispensable parts of the wire production program . . . that urgent schedules find Vaughn products worthy in war as they were—*and again will be*—in peace!

THE VAUGHN MACHINERY CO.

CUYAHOGA FALLS, OHIO, U. S. A.

Complete Cold Drawing Equipment . . . Continuous or Single Hole . . . For the Largest Bars and Tubes . . . For the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys

TO GET THE ULTIMATE *Use*

Vascoloy RAMET

T M. REG .U S. PAT. OFF

TANTALUM-TUNGSTEN CARBIDE DIES

FOR DRAWING	For drawing fine wire, heavy wire, special shapes, tubing, etc. For shell and cartridge cases from the blank to completed case.
FOR COLD HEADING	Rivets and any number of small upset parts required in large quantities to close tolerance.
FOR COLD NOSING	Artillery shells.
FOR EXTRUDING	For extruding operations on a wide variety of parts because of quantity and tolerance requirements.

MORE PRODUCTION, BETTER FINISH, AND CLOSER TOLERANCE—these characterize the high performance of Vascoloy-Ramet Tantalum-Tungsten Carbide Dies. All these factors contribute to getting the ultimate with drawing, cold heading, and extruding dies.

TANTALUM-TUNGSTEN CARBIDE DIES are now used for countless forming, nosing, drawing, cupping and extruding operations on articles of war materiel. Our special die department offers its services and experience to manufacturers making products requiring these operations.

If carbide dies can be used to advantage, we will design and produce Tantalum-Tungsten Carbide Dies that will assure you the ultimate in performance.

437

Ramet

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS • DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES • IN CANADA: CARBIDE TOOL & DIE CO., LTD., HAMILTON, ONT.

TANTALUM-TUNGSTEN CARBIDE

FOR HIGH PERFORMANCE • • • *Specify* Vascoloy RAMET DIES

Announcing
the addition of a new line of wire machinery
THE Syncro Machine Company has added the entire line of wire machinery developed by Mr. A. R. Petterson, prominent wire engineer, to its line of equipment.
Mr. Petterson is president of the National Wire Machinery Company and he was formerly associated with the Thomson-Judd Company. Mr Petterson is a well-known and highly competent designer of wire and cabling machinery. The equipment he has developed has proved highly satisfactory in actual service in wire mills throughout the country.
The addition of Mr. Petterson's full line of wire and cabling equipment to the already broad Syncro line, affords wire and cable manufacturers an even greater choice of high quality equipment built by Syncro.
SYNCRO MACHINE COMPANY
RAHWAY, NEW JERSEY
McCORMICK BLDG., CHICAGO
REPRESENTED IN CANADA BY CANADIAN ELEVATOR EQUIPMENT CO. LTD., TORONTO
Machinery for the Wire Industry
SYNCRO
703
November, 1943

Worth repeating...

Syncro now meets *all* requirements.

The recent acquisition by Syncro of the line of wire machinery developed by Mr. A. R. Petterson, now completes our line and enables us to meet your every requirement.

Regardless of whether your needs are for wire or cable processing machinery, for processing either ferrous or non-ferrous metals, your most exacting requirements can now be fully met in Syncro quality built equipment.

- Rodblocks
- Wire Drawing Machines
- Stranders
- Closers
- Cablers
- Armoring Machines
- Tapers
- Juters
- Serving Heads
- Compound Tanks
- Saturating Tanks
- Capstan Sections
- Pay Offs
- Re-Reelers
- Respoolers
- Capstan take ups
- Heavy duty take ups
- Measuring Machines
- Coilers
- Wire Covering Machines
- Portable cut-off machines
- Insulating Machines
- Electric rod pointers
- Die Stringing Machines
- Wire Rope Machinery
- Tinning Machinery

Magnetic Slip Clutches and Special Machinery

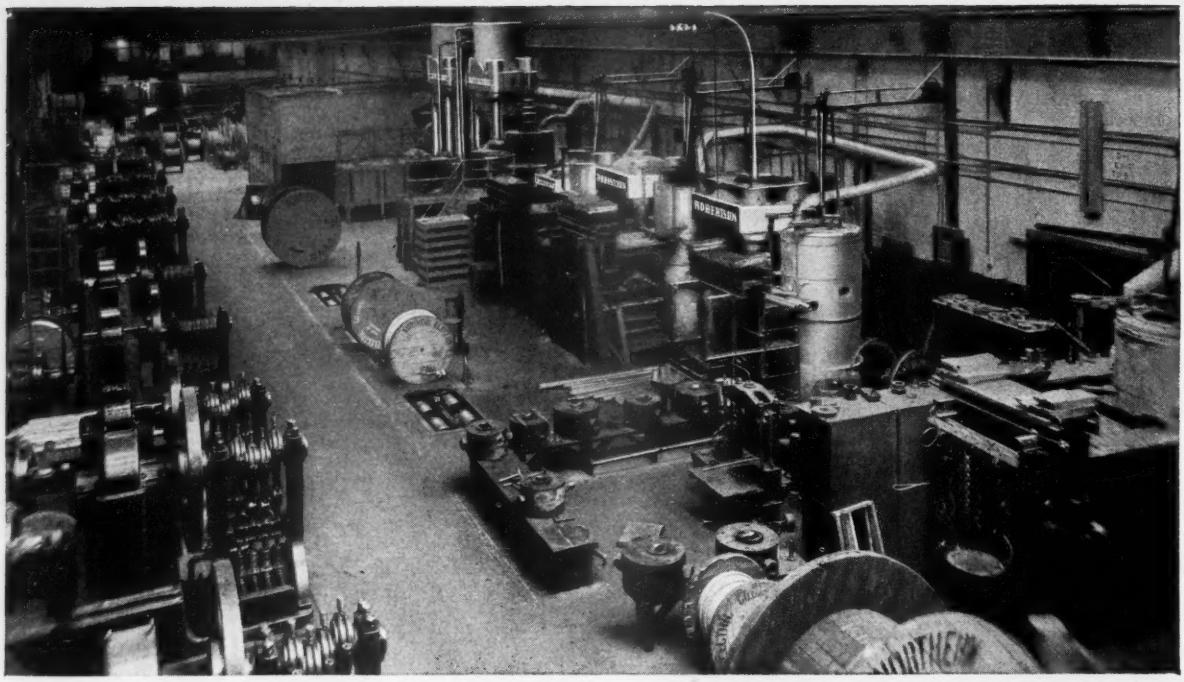
SYNCRO MACHINE COMPANY

RAHWAY, NEW JERSEY
McCORMICK BLDG., CHICAGO

REPRESENTED IN CANADA BY CANADIAN ELEVATOR EQUIPMENT CO. LTD., TORONTO

Machinery for the Wire Industry

SYNCRO



★ ★ ★ STARS IN THE FIELD OF LEAD CABLE ENCASING EQUIPMENT

For over 85 YEARS, Robertson has enjoyed the distinction of leadership and trust that has warranted sales, re-orders, and years of service to the largest names in American Industry. Robertson Lead Cable Encasing Equipment has been, in many instances, a REQUISITE, and has proved its worth, efficiency, and reliability time and time again.

Write us, (on your letterhead) for complete information contained in our Bulletin which we will be glad to send at no cost to you.

JOHN ROBERTSON CO., INC.,
125-37 Water St., Brooklyn 1, N. Y.

ROBERTSON EQUIPMENT IS USED BY THE FOLLOWING LEADERS IN THE FIELD:

Roebling	Western Electric
Phelps Dodge	Phillips
General Cable	Anaconda
General Electric	Okonite
Crescent	Kennecott
Simplex	Kerite
Northern Electric	American
Collyer	Paranite

ROBERTSON

Established 1858 **• Designers and builders of Lead Encasing Machines and Hydraulic Equipment, Including Extrusion Presses, Hydraulic Pumps, Melting Furnaces and Pots, Dies and Cores, Hydro-Pneumatic Accumulators, Lead Sheath Stripping Machines, and Special Equipment for Special Uses.**

Rodine
Makes Pickling Efficient

This steel surface photograph (magnified) was pickled in an uninhibited acid bath. Note the deep pits, and that the surface is visibly crystalline.

This surface pictured was pickled exactly like the other except that RODINE was added to the acid solution. Only scale pockets and roll marks are visible; no pitting occurred.

All steel requires pickling to remove scale whether the fabrication is for steel plates for battleships, airplane parts, motor vehicle or ordnance parts.

RODINE in the pickling bath confines the acid action to removing the scale and inhibits acid action on the clean metal. This controlling action of Rodine in preventing the acid from dissolving clean steel, saves acid by eliminating a needless waste. The life of the pickle bath is increased and better pickling is accomplished.

Manufacturers of Inhibitors & Metal Working Chemicals

AMERICAN CHEMICAL PAINT CO.
AMBLER ACP **PENNA.**

Note: West Coast Plants may address inquiries and orders for prompt delivery to, Leon Finch, Ltd., 728 East 59th St., Los Angeles, Calif.

RODINE

- **Saves Acid**
- **Saves Steel**
- **Prevents Overpickling**
- **Minimizes Blistering**
- **Reduces Embrittlement**
- **Diminishes Noxious Fumes**

Write for
Technical Service Data Sheet

CHEMICALS ACP PROCESSES

American Chemical Paint Company, Ambler, Pa.
Please send me general Technical Service Data Sheet on

☐ RODINE

*Name*_____ *Title*_____

*Company*_____

*Address*_____

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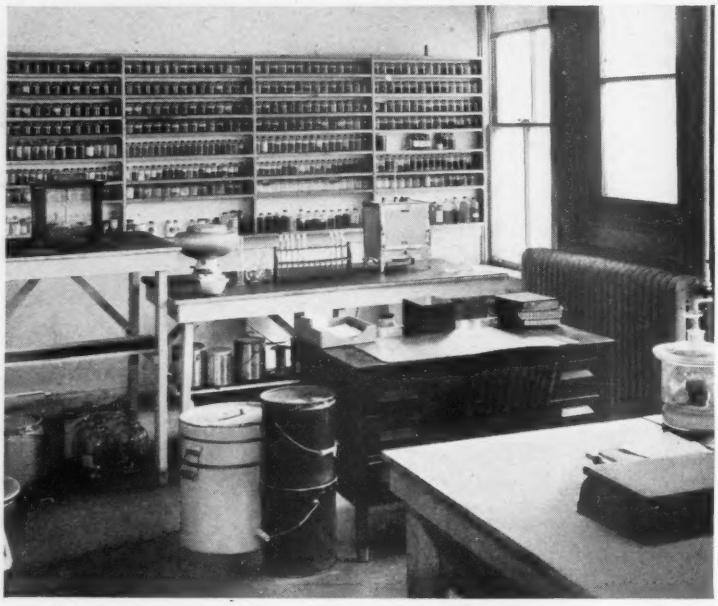


ANOTHER PRODUCT OF OUR LABORATORY

No. 70 WIRE DRAW

USES: . . . . . For drawing stainless steel, high carbon spring or rope wire.

FINISH: . . . . . Regular lime or sull coat.

CHARACTERISTICS: Used as a lubricant for drawing stainless or alloy wire without the use of lead or other metallic coatings. Used with a lime coat only (9%) on this type of wire. Used on any other steel that has bad surface seams, scabs, or slivers, where a heavy coating of lubricant is necessary for cloaking purposes. Also being used more and more for the fine patented high carbon wire to be drawn dry.

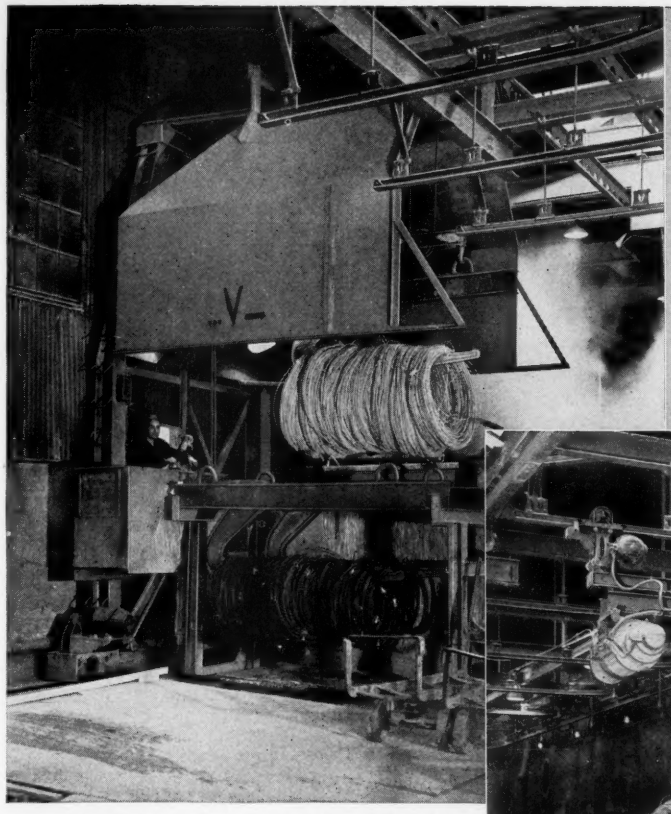
SHIPPING UNIT: . . 300 Pound Barrel.

Standardize with Standard

Standardize with Standard

MANUFACTURING PLANT AND LABORATORY, 4600 W. FERDINAND ST.

STANDARD INDUSTRIAL COMPOUNDS CO. . . . CHICAGO 44, ILLINOIS



PRODUCTION
in all Departments of Wire Mill
SPEEDED

Above—One of two Cleveland Tramrail gantry cranes in the cleaning house. If worked three shifts a day, this crane can clean 350 tons of rod, as it handles 2700 to 3000 lbs. at a time.

•

Right — This Cleveland Tramrail cab-operated carrier transports heavy loads between the various departments on the overhead Tramrail system.

...at The Steel Company of Canada

Cleveland Tramrail overhead materials handling equipment unloads the rod from incoming railroad cars and delivers it to storage. It speeds it through the various cleaning house operations. It conveys the rod to the drawing blocks, strips them, and hauls the wire away. It serves every department of the large wire mill of The Steel Company of Canada in Hamilton, Ontario.

Plant efficiency is greatly improved with Cleveland Tramrail equipment. It provides interdepartmental handling without the need of wide aisles and thus permits a larger percentage of the floor area being devoted to manufacturing. Damage to materials and equipment is reduced.

In the cleaning house Cleveland Tramrail enforces cleanliness, orderliness, and better working conditions, and lowers the cleaning cost per ton. Cleveland Tramrail block-stripping cranes and carriers make possible the drawing of heavier bundles and enables a man to take care of more blocks, thus speeding wire-drawing.

Now is the time to thoroughly study your methods and equipment. Cleveland Tramrail engineers will gladly co-operate with you.

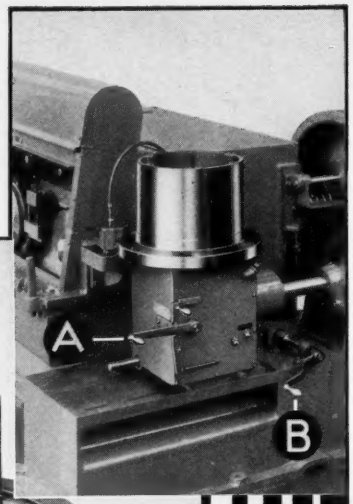
GET THIS BOOK!

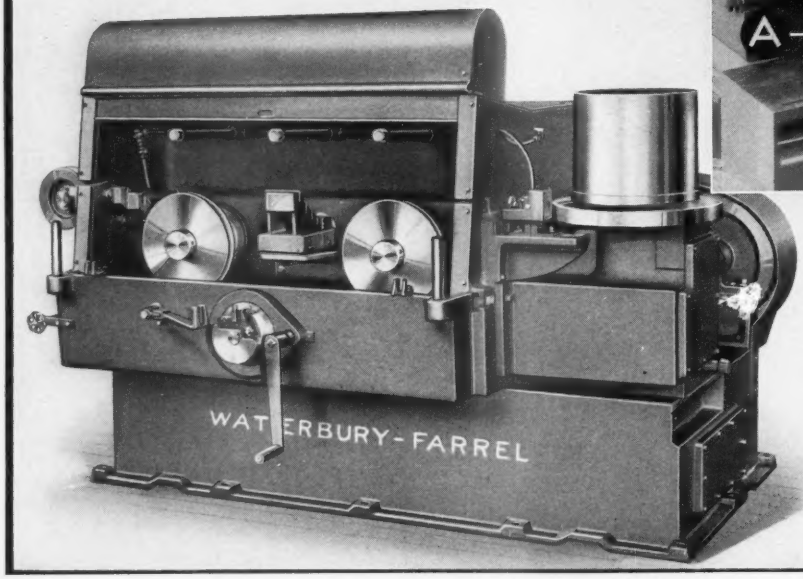
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1141 EAST 283RD ST. WICKLIFFE, OHIO.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

WIRE DRAWING MACHINES





FOUNDED WATERBURY FARREL 1851

by WATERBURY-FARREL

WITH WIRE BLOCKS WHICH *rotate in either direction*

Upright Cone Continuous Machines with provision for quickly changing the rotation and position of block.
Two conveniently located removable handles do the trick in jig time—

A — changes direction of rotation
B — shifts position of block - - -

The machines are available with blocks of various diameters or with spooling devices. Our wire drawing machinery is described in Catalog W.

• WIRE AND ROD MACHINERY • COLD HEADING MACHINERY, ETC. •

WATERBURY FARREL
FOUNDRY & MACHINE COMPANY
WATERBURY • CONNECTICUT • U•S•A

CHICAGO CLEVELAND NEWARK, N. J.

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 18 DECEMBER, 1943 No. 12

Designated as

Official Publication By The Wire Association

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Vol. 18 DECEMBER, 1943 No. 12

The Drawing of Fine Uncoated Steel Wire

By R. R. Preston,

Sales Engineer, Carboloy Company, Inc.,
Pittsburgh, Penna.

This paper was presented before the organization meeting of the Pacific Coast Chapter of The Wire Association at San Francisco, Calif., on October 29, 1943 and was read by Mr. Ray D. Mack, Pacific District Manager of the Carboloy Company. ✦ ✦ ✦ ✦ ✦ ✦

MR. POTTER, members of the Wire Association and guests:

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THE paper which I am about to present to you on the subject of drawing fine uncoated wire has been prepared specifically for this meeting because there is such an unusual amount of interest in this subject here on the coast. The author of the paper is **Mr. R. R. Preston,** die engineer with the Carboloy Company. Mr Preston has had thirty-five years of widely varied experience in the wire drawing industry. Before transferring to Carboloy Company, he was Superintendent of the wire mill at the Page Steel and Wire Company — so you may be sure that he is intimately acquainted with every detail of wire drawing practice which he discusses. It was impossible for Mr. Preston to attend this meeting and I know he would expect me to express his deepest regrets because of his inability to be present here this afternoon.

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THE art of wire making is probably a lot older than some of us realize. In fact, it's one of the very oldest of all the metal working skills. We know for certain that men in pre-historic ages knew how to make wire of a sort, for gold, silver, and bronze wires have been found in ancient Egyptian graves; also among the ruins of Troy; in the burial places of tribal chiefs in Denmark and Ireland. So evidently the wire industry — or rather, I should say, the wire-making **art** — was just as world-wide several thousand years ago as it is today.

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DURING those early centuries in the wire business, wire was not "drawn." Instead, metal was first beaten out into thin plates and then the wire was made by shearing off thin strips from the plates. When longer wires were needed, the smiths soldered or welded several of the shorter pieces together. In Roman times, wire was made by hand forging small bars down to the required size. In this way, Roman wire men made strong bronze wire and later plaited it into cables.

R. R. PRESTON

Following graduation from Goddard Seminary, Vermont in 1907 entered Page Woven Wire Fence Co., became Asst. Superintendent of the Wire Mill, Page Steel & Wire Division of American Chain & Cable Company in 1920, and in 1924 was appointed Superintendent, which position he filled until 1941. In September of that year, joined the Carboloy Company, Inc., as Sales Engineer in the Pittsburgh District of that organization. Member of the Wire Association.

Designated as Official Publication by the Wire Association

JUST when dies and draw plates were introduced is not known for certain. It must have been some time during the Dark Ages in Europe — say between 800 A. D. and 1000 A. D. At first, the wire smith worked the metal down to a thin pencil and then drew this pencil by hand through smaller and smaller dies. That was extremely hard work as we all know, so sometime in the Eleventh or Twelfth Century the wire drawing bench was invented in which a lever or a windlass was used to pull the wire through the plate.

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ONE interesting device widely used among the wire men of the Middle Ages consisted of a swivel chair in which the operator sat. He took the end of the wire as it came through the die and secured it to a ring fastened to a stout leather belt which he wore around his waist. Then he swiveled in his chair, putting all his weight and plenty of momentum into the action. In this way, he drew the wire through the die much more easily than he could have done by hand.

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THE best customers of the wire makers of the Middle Ages were the knights. Their suits of chain mail were really nothing but coats — and pants, too — made from thousands of small iron wire rings. Each separate link was shaped and forged by hand from thin strands of metal which had been reduced from bars by hand hammering. The finished links were joined together and welded in such a way as to form a metal cloth which was strong enough to withstand heavy blows and yet pliant enough so that the wearer could move about and even sit down in it. Ordinarily, **drawn** wire was not used for this armor because the wire men of those times had their headaches too. They just didn't know how to keep up the physicals of their drawn product and so a suit of chain mail made from it, might be too brittle or too soft. A knight wearing it was just asking for trouble. When the knights switched to armor that was made out of steel **plates**, the wire men probably all felt that their business was heading for the rocks — but somehow or other, it never quite made the rock pile.

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WITH a background like that to our business, I think that we all may be proud of the accomplishments which we have witnessed in wire drawing just in our time. Today, there are between one hundred sixty thousand and one hundred eighty thousand different uses for wire of all kinds and sizes. That's a good indication as to the importance of our business in modern civilization.

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THOSE figures also show you that the whole field of wire drawing is so vast that even if I **did** know all about it, I could talk here every afternoon for the rest of my life and still not cover everything. So I am accordingly limiting my remarks to a general discussion of one small phase of wire drawing — a phase which right now is of vital importance to everyone here because of its bearing on war production. That subject is — THE DRAWING OF FINE WIRE WITHOUT A COATING OF COPPER, TIN, OR ZINC. It is the type of wire which is now being used in such large quantities for rope wire aircraft control cables, and to a lesser degree, balloon barrage work. I am going to pass along to you some of the techniques which have been found to give good results; to step up production; and to cut down the number of headaches suffered by mill men in general.

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HOWEVER, before we get into specific problems, it may interest you to know that prior to the introduction of tungsten carbide wire drawing dies some fourteen years ago, the drawing of fine steel wire was considered to be one of the true arts — and was just as tricky as many of the arts are. Those of us who had the responsibility for producing wire any smaller than .016 inches in those days, really thought that a fine wire drawer capable of setting his own plates and keeping his bench operating with any kind of efficiency at all was worthy of the name of Artist. In fact, before the advent of carbide dies, I think I can truthfully say that in the Pittsburgh area there were not more than three finished fine steel wire drawers who were worthy to be called as such. There were not so many more than that in the New England area, at least there were not enough there to supply the demand, even though New England is considered the home of fine wire drawing in the United States.

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IN those early days — although they were not so many **years** back — very few plants operated their fine wire benches more than a single shift. It was very difficult to get fine wire drawers, using the same technique in setting their plates, to follow each other. Therefore, more wire was produced and less scrap was made by operating the benches on single shifts.

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THE development and widespread use of carbide dies made possible the general use of continuous wire drawing machines. These had not been used to any great extent until this time, since dies made from other materials had to be changed too frequently to justify the use of continuous machines. With the adoption of the improved equipment, with its greater capacity and lower production costs, the demand for fine steel wire has increased by leaps and bounds. Today, fine steel wire is playing a very definite part in winning the war, and this makes it all the more important to know the proper techniques of producing a high grade product on a quantity basis.

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GENERALLY speaking, the three most important things

in drawing uncoated fine steel wire are:

1. **Cleaning**
2. **Lubrication**
3. **The Dies Themselves**

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NOW let us start at the beginning of the fine wire drawing process and follow it through step by step.

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SUPPOSE that we start with, say, .036 wire which has been properly patented in a conventional type of patenting furnace. Here, we should be sure that the wire is free from all scratches before it is given the final patenting. Uniformity of carbon content is important for best results. I'm not going to say very much about the patenting process itself because every mill man has his own methods — his own ranges of time, etc. — that work best for his particular conditions. However, there are a number of factors controlling the economic drawing of fine uncoated steel wire which are affected by patenting methods and equipment, as I will endeavor to point out as we go along. One thing I might mention at this point — if large quantities of wire are to be drawn — it is always good practice to send through pilot lots from each heat of steel because different **heats** of steel of the same analysis often work differently.

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AFTER patenting, the wire must be thoroughly cleaned. Here the importance of all the various operations which are grouped under the general head of "cleaning" cannot be over-emphasized. One good practice is to clean the wire first with Muriatic acid and then with Sulphuric acid. However, good clean wire can be obtained by using either the Muriatic or the Sulphuric alone — if conditions are right. If your mill has a small cleaning house with just a few tubs, then you'll probably be better off using Sulphuric acid alone. Though the Muriatic acid is actually the better cleaning agent of the two, it's also the more expensive. On the other hand, the Sulphuric acid gives a slight etch to the surface of the wire and this etch makes the lime stick better later on.

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THE wire must be well spread out on the yokes before immersing it in the acid baths, because the cleaning process **must** remove all traces of scale from the metal. If the scale proves to be too tight, then the wire will either have to be left for a longer time in the acid — or else the atmosphere in the patenting furnace will have to be re-adjusted so as to give a heavier, looser scale which will come off more readily. Re-adjusting the furnace, of course, is a much more satisfactory solution to the problem than letting the wire soak in the acid. For instance, it has been found that the time saved through the use of modern electric patenting furnaces sometimes results in the formation of a very tight, thin scale which is extremely difficult to get off the wire. This, as already pointed out, can be controlled by varying the atmosphere. In any event, one of the things to watch for in patenting is to get the kind of scale that can be easily removed by your own particular cleaning setup.

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AS to acid bath temperatures, you can use the Muriatic acid cold. The Sulphuric acid, however, works best when it is kept somewhere between one hundred twenty and one hundred thirty degrees Fahrenheit. The main thing about this bath is not to let the acid get too hot, and also not to let the wire remain for too long a time in the bath. Either one or the other condition may pit the surface of the wire or even start acid embrittlement in the steel. It is also good practice to remove the bundles of wire from the acid when they are about half cleansed, rinse them with water to remove the scale which has been loosened, turn the bundles, and then put them back into the acid.

AFTER the wire is clean, it must be well rinsed while on the yoke. A good device to take care of the rinsing is a tub partially filled with running water which comes from a high pressure spray arrangement on the sides of the tub. The wire is dipped up and down in the tub through the spray. This arrangement is particularly good for taking off loosened scale.

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CAREFUL visual inspection of all wire after the rinsing operation is absolutely necessary if you want to be sure of getting a high grade finished product. The wire should be examined to see whether or not there are any bits of scale still sticking to it. In cases of doubt — such as cases where the scale is thin and therefore hard to detect — bend the wire a little which will make any thin clinging scale pop off.

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ANOTHER thing to look for on the rinsed wire is **smudge**, caused by the action of the acid on the steel. Of course, the wire — as it comes from the rinse — should be bright and free from all smudge. Sometimes, however, even in the best of plants — it just **isn't.** The bad thing about acid smudge sticking to the wire is that it is liable to form an abrasive material which later on may scratch both the wire and the dies. Then, too, smudge comes off easily and — after the liming operation — will carry the lime away with it. So — inspect every bit of wire as it comes from the rinse. A little time spent in doing this will keep you from getting a lot of headaches and grey hair.

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NOW that we have clean wire, we're ready for liming. Here, the characteristics of the lime itself are of major importance. Some limes work well — and some **don't.** Probably the best bet is to work with a reputable firm and have them recommend the grade of lime

most satisfactory for drawing fine uncoated steel wire. Air slaked lime is undesirable for any kind of wire drawing requiring more than two drafts. One other important thing about lime is that it must be free from grit. Lime, it should be remembered, has to perform a triple duty — it neutralizes the acid; acts as a lubricant carrier; and keeps the wire from rusting.

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AFTER slaking the lime, it is desirable to age — or hold — it in putty form from thirty to sixty days before using it. One method of accomplishing this is to have two lime vats, each one capable of holding a sixty to ninety days supply. Then, when you clean one vat, you can start using lime from the second one right away and at the same time you can slake more lime in the first vat.

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IN the liming operation, it is usually best to take the lime in putty form, put it into a steel tub, and thin it with water, to, say between eight and ten per cent by titration. A rather heavy lime has been found to give good results in drawing uncoated fine steel wires.

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THE lime solution should be kept around one hundred eighty degrees Fahrenheit. Four to six dips of the wire into this is generally about right, although each mill will have to determine the number it should actually use. The stock should be turned over between each separate dip so that every strand gets thoroughly covered with lime. Too heavy a coating of lime on the wire, however, will cause is to flake off.

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A SLIGHT variation in this method — and one which is being employed with good results in numerous plants today — is to take the stock from the rinse water and put it first into a tub containing an alkali cleaner to neutralize the acid. This cleaner should be held at a temperature of one hundred eighty degrees Fahrenheit, and the wire should be allowed to soak in it from four to six minutes. The alkali cleaner also takes off any smudge and grease which may be left on the wire after the acid cleaning and the water rinse. Then the wire is limed as usual.

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THE baking process which follows liming dries the lime on the wire and also prevents any tendency of the wire towards acid embrittlement. Apparently the most successful baking method at this time is the **tunnel type of baking** with the temperature held at three hundred to three hundred fifty degrees Fahrenheit. Sometimes the wire is put through the baking oven on a truck; at other times on racks on a sloping track.

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BAKING time depends a good deal on the type of baking oven used. For instance, in the older types, it used to take something like eight hours to produce adequate results. In some of the newer circulating types of bakers, from one to two hours is enough. The correct baking time required, of course, has to be determined independently by each plant on the basis of experience due to variations in mill conditions. Another thing to be remembered however is to bake the wire long enough, otherwise the lime will come off in drawing.

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NO matter what type of baker is employed, or how long the wire is held at heat, it must be inspected **after** leaving the baker and **before** delivery to the draw benches to see that the wire is still entirely free from rust. If rust is present after liming, it will come right through the lime coating during the baking operation and is then visible. If the baked wire does exhibit this condition, the only thing to do is to take the stock back and clean it again.

THE wire shouldn't be stored too long after baking, either — say a maximum of between eight and sixteen hours — certainly no longer than that. If the wire is left lying around longer than that, the lime coating will soften and rust will form on the steel, causing difficulties in drawing, later on.

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AFTER butt welding, the flash is removed with a file. All remaining burrs should be removed with a piece of emery cloth, and the bare wire at the weld lubricated by rubbing it with a piece of hard soap. A cake of ordinary laundry soap is excellent for this purpose. Be sure that the diameter of the wire at the weld is slightly under the normal wire size to prevent fracture in drawing.

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KNOWING just how much welding heat to use in order to get good welds is all a matter of experience. It's something you just have to work out by trial and error. Either too much heat or not enough heat may cause breaks during drawing. A little intelligent experimenting with the welder, however, should be enough to enable the operator to turn out welds which will seldom — if ever — fail. Nevertheless, it is good practice to insist that operators use magnifying glasses for checking the condition of the wire at the welds. Constant use of the glass will prevent a lot of trouble. They are available with the welding equipment.

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NOW in drawing, the very first draft — when the wire passes through the box on the outside of the machine — should be a skin draw and drawn dry. Here, a very fine soap should be used. Or you can use soap flour for this purpose. A lot of plants use the latter. Both work well. The soap should be periodically "freshened" to prevent excessive contamination by the lime which is left when the wire passes through it. In this first draw, the wire should not be re-

duced more than .002 inches — just enough to form a coating on the uncoated wire. If the draft is much heavier than this, so much of the lime coating will be scraped off that there won't be enough left to carry lubricant through the remaining wet dies in the machine. After the first draft, a reduction of about twenty-five per cent per draft has been found satisfactory.

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AS for the dies themselves, good practice is for the die on this first pass to have a thirty degree for lubrication entering angle blended into a light twelve degree approach angle. The bearing length should be around a minimum of seventy-five per cent of the wire diameter. The stock should enter the remainder of the dies in the machine on a twelve degree angle with a seventy-five per cent bearing length.

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A GOOD finish and polish must be maintained in the dies when drawing fine uncoated wire. This is, of course, particularly vital on the finishing dies. It is well to remember also that a smooth well polished carbide die, aside from improving product quality, will last far longer in service, before again requiring polishing.

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THE first sign of wear in a carbide die used for any kind of wire drawing is at the approach angle where a light ring begins to form as the die starts to wear. If this ring becomes too deep, it will scratch the wire and then the die will have to be rough drilled in order to completely remove the ring. We strongly urge that those of you who are using carbide dies for drawing **fine** uncoated wire establish a rigid routine for servicing these dies on the basis of removing them before they show visible signs of wear. **Finishing** dies usually should be removed and replaced more often than the dies used in the previous draws — say about every eight hours or so for the one, and every sixteen hours for the others.

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THE lubricant used is also very important in the drawing of fine uncoated steel wire. There are many lubricants on the market. Usually, the best success is obtained by keeping the fat content between three and four per cent by volume, or as near the three per cent mark as possible. Temperature should be maintained at one hundred ten and one hundred twenty degrees Fahrenheit. The lubricant should be tested for fat content at least once every twenty-four hours.

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EACH different installation has its own correct speed for drawing fine uncoated steel wire of different carbon contents. Older equipment will give as low as one hundred fifty feet per minute drawing speed. Speeds with modern continuous machines range all the way from eight hundred to twenty-two hundred feet per minute. However, the average favored rate for drawing high carbon, fine uncoated wire is between eight hundred and one thousand feet per minute on most machines. The average, of course, is slightly higher when drawing low carbon wire, say between one thousand and fifteen hundred feet per minute.

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I WILL go as far as to say this. If you can't draw fine uncoated wire as fast as eight hundred feet per minute, using carbide dies in modern continuous machines — then I'd suggest you give your entire setup a thorough inspection and overhauling, including the patenting, cleaning, liming, and baking, because there is a possibility of something being wrong with your setup.

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NOW for a couple of miscellaneous hints, and then I'll be through for the afternoon.

IN drawing the finer sizes—and here I refer to sizes smaller than .010 inches — it will make less work for the operator if the machine is equipped with a spooling attachment which can be used in place of the take-up block. The spooler will save both time and scrap.

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SOMETHING else I might mention is this. If the total reduction required from the initial stock to the finished wire works out to be more than twenty-five per cent per draw, then it becomes necessary to put in extra drafts. This can be done on single draft machines and finished on the continuous machines. However, it is always better to avoid split drafting.

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AS for wire pointing—I might just say that for the first two drafts, you can use a hand pointer if you want to. But for the remainder of the drafts — on small size wire — it's best to pull the points.

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YOU'LL find incidentally that fine wire — produced in the manner we've covered this afternoon will lend itself exceptionally well to tinning without the use of copper.

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THIS brings us to the end of my remarks. In closing, I want to re-emphasize one thing. The successful drawing of fine uncoated wire is not alone a matter of good dies and die maintenance — or of proper patenting — or proper liming with the right grade of lime — or correct baking — or complete cleaning. IT'S A COMBINATION OF ALL OF THESE THINGS.

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THANK you, and good afternoon.

The discussion which followed the presentation of this paper is printed in full on Pages 768 and 769 of this issue and a description of the entire meeting will be found on Page 789.

Proceedings of the Technical Session of The Pacific Coast Chapter of the Wire Association

Held at the Sir Francis Drake Hotel, San Francisco, California, October 29, 1943

The Afternoon Session of the Wire Association was called to order at two o'clock P. M. by **Major Richard E. Brown, Mr. Earl R. Potter** acting as chairman of the meeting.

Major Brown: Before Mr. Potter calls the meeting to order here is the method we follow in conducting Wire Association meetings. There is a stenotype operator who takes down the discussion, but not the paper. When the paper is concluded the Chairman calls for questions. When you ask your question just give your name, — Jones, Smith, or Brown, that is all, not your company or anything more. That is for the purpose of editing the material before publishing. When we publish the material we don't publish the name, we just say "a member", but for editing we have to send it back to you so that you can check your remarks. So give your name and that is a guide for the editor. Then when you send it back we publish it in the magazine.

Mr. Earl R. Potter: Gentlemen, make yourselves comfortable around the table. We want to get the dope and be where you can write. Make yourselves comfortable because you're going to be tied to a chair for an hour or so.

. . . Story by Mr. Potter off the record . . .

Chairman Potter: Well, this afternoon we are going to put our worries on somebody else's shoulders. We are to have a technical paper this afternoon prepared by Mr. Preston, formerly Wire Mill Superintendent, Page Steel & Wire Company, now Die Service Engineer, The Carboloy Company, Inc., Pittsburgh, Pa.

Mr. Preston was to be with us, but due to unavoidable conditions couldn't make it, so Mr. Mack has kindly agreed to read the paper. We will have an open discussion on the paper after it has been given by Mr. Mack and I hope that you will enjoy it and will then join in and make it as understandable as possible.

I now give you **Mr. Ray D. Mack,** Pacific District Manager, Carboloy Company, Inc., Huntington Park, California.

. . . Thereupon Mr. Mack read the prepared paper for Mr. Preston . . .

Mr. Ray D. Mack: While we probably will not be able to answer all the questions we will do the best we can. There probably will be a lot of questions that you fellows are interested in, and I would like to make the arrangements now to have the questions taken down and handed to Major Brown, the Executive Secretary, and then we will try to get you such information as you may request from Mr. Preston at Pittsburgh.

Chairman Potter: Now gentlemen, we know what is the problem in the wire industry today. That guy away back had that swivel chair and we are not rid of it yet today.

Mr. Mack, we are indeed indebted to you for your fine cooperation in presenting the paper. You did a fine job and the Association thanks you for your cooperation and help.

I realize, gentlemen, there are a lot of men here in this group today who know nothing about what has been said. There are a lot of details involved in this thing. To the wire men they may be common, every-day occurrences. Some of us got a few new ideas to try. But to most of you; the wire rope people who don't draw their own wire, welding people and others, this is a lot of detail not interesting at all. However, there have been many points covered in this paper that bear a little discussion. Has anybody a question with which to open the discussion? We would like to have you give your name before you start.

A Member: I would like to ask the range of sizes within which this paper generally falls? What is the definition of "small"?

Mr. Potter: I think he said starting with primarily wire about .036 and working down on to ten.

It might help a bit if the fellows who have drawn their wire would tell their experiences or the problems they have had in drawing fine wire. They are in the black end of this which we are trying to accomplish.

A Member: We have had quite a bit of trouble with our wire drawing. We are still trying to lick it. We have had most of our success with drawn galvanized wire. I am still looking for ideas on the subject.

Chairman Potter: There is a remark made here in the paper about changing every sixteen hours.

Mr. Mack: That is right.

Chairman Potter: I think we are having pretty good luck, don't you? I think we are away above the average.

Mr. Mack: I think the way Mr. Preston was talking. In other words, in the early part of his paper he stated that as soon as the ring started to appear. If it was allowed to remain any longer than that the ring might become too heavy, and it could be polished out if it was changed frequently. If allowed to run any longer it might become so deep that it would be necessary to rough drill which would cut down the life of your die. I think the action would be similar to cutting tool and that is, a slight ring will start to wear in the die for so many thousand or so many feet of wire. For the next comparative run your run would become much deeper. A cutting tool operates in the same condition. It will run for so long and develop say a 5000 on the cutting edge. Now to run it so that your lime becomes ten thousandths of five thousand increase in width you are going to get about half your run, if you had taken that out and reground to remove that lime. Referring to that, I think you ought not to let the ring become too deep because it would require additional rough drilling and polishing which could be saved.

A Member: We change ours twice a week in each machine, and I am afraid you would have to change every four hours to save .018 die entirely, because to get a less ring in there you would have to have .020 or larger.

Mr. Mack: How long do you hold your bearing lengths?

The Member: 50% to 75%.

Mr. Mack: That checks with your experience? Change your dies that frequently?

Chairman Potter: That is what we want to get away from, changing the dies.

Mr. Mack: I mean, do you change yours twice a week?

A Member: Drawing of small wires. The rest of the people on the coated wire, copper and tin, of course, run 5000 pounds, which is roughly a week's run.

A Member: The wire we run is 500 pounds, through the same set of dies, about a one or two day's run. The trouble is in the drawing, just working out your dies. We know the surface of the wire is not being properly treated. We have tried everything that is possible to try, but still it won't work. We hoped that that fellow Preston would be with us to really answer some of our problems on this, and let us see what they have back there.

I think that would be a good question to have Major Brown take down and get a little clearer picture of, if there are enough people here interested in it. Give the names of the people primarily interested and for the class of work they are doing.

Chairman Potter: There is a new article on the market today known as Cuprodine and they are using it a lot in drawing shell casings, steel shell casings. That is becoming more extensively used in coating wire now back East. Have you used any of that?

A Member: No.

Chairman Potter: It takes the place of copper and tin. There may be something in it that can't be accomplished, I don't know, but we might be able to solve the problem with this Cuprodine, made by the American Chemical Paint Company. It is a pure copper finish. It is not a protective coating of any kind, but a lubricant to get the wire through the machines so it will stand up. It has not been used long, but it is something new on the market.

Something naturally will come out of that. We are just about in a position to get some in the plant now. I was waiting until today though as I thought somebody might have had some experience on it, before I ordered a sample drum to try it out. I think that will be our next try at our place.

A Member: Ever tried lead coating?

Chairman Potter: No, never have. I imagine it would work perfectly all right, but you have the problem of putting it on and taking it off.

The Member: Can you do that?

A Member: No. He had a lot of stainless to draw. Earl draws most of his though and that was the idea there, it wasn't coated before we drew it. We intended to convert one of our furnaces into a lead furnace, but after we figured the size of the pot it took 2000 pounds of lead to fill it, so we didn't do anything with it.

Chairman Potter: Any more questions anybody has on this thing? Any more discussion? Has someone else any ideas? How about the mill men? It is not confined to the wire men here.

A Member: I would like to ask a question, how do you draw this hot galvanizing wire?

A Member: That draws easier than uncoated wire.

A Member: We tried it several times and it flaked off.

A Member: The trouble was in your galvanizer and not in the drawing. We haven't had trouble of that sort.

A Member: Our kettle is only five feet long, so I don't imagine our wire is over four and a half feet, but we seem to have a very decided iron, zinc alloy on it outside of our wire. When you try to draw it the zinc peels off and we haven't anything.

A Member: What carbons of steel?

A Member: Eight, ten.

A Member: Might be the trouble there, you don't get a good, tight coat on your lower carbons that you would on higher carbons which we are using.

A Member: That no doubt would make a difference.

A Member: What is the grade of zinc?

A Member: Mostly reclaimed.

Chairman Potter: Would that make a difference?

A Member: We had the galvanizing trouble a few years ago and brought out an expert to look our situation over. One of the things he recommended strongly for good coating of wire was the use of electrolytic zinc entirely for wire drawing.

A Member: This reclaimed zinc is made the same way as they make the Prime Western zinc in the first place, they simply take the ore and distill the zinc out, and recover it that way through clay pipes so their tests are away up, 98% pure zinc. There has also been a lot of argument about using anything but Prime Western zinc but we never could find any difference.

Chairman Potter: Jack, can't you give us some ideas on wire drawing?

A Member: About those shells. I was over to one of the companies where they have a bunch of engineers that are really up and they have changed from brass to steel sheels. They have had a lot of trouble making this conversion and they have sent their engineers to other plants. I am going to find out what they are using. They have gone into the lubrication angles quite extensively. The shells are coated, spheroidized steel.

Chairman Potter: Regarding this Cuprodine, Mr. Stewart I believe is the man's name, from the American Chemical Paint Company was out and made a visit here about a month ago and he says they are using it in the East to some degree in drawing wire and having a lot of success. Costs about 32 cents a pound; it is expensive, but it will make your dies last and cut out a lot of other problems, and in the long run be a lot cheaper. At 32 cents a pound it should be good.

Leone-Finch handles the material in Los Angeles, #728 East Ninth Street, Zone 1, Los Angeles. Mr. Norman Stewart is quite familiar with it and he is the Agent. They are lacquer and synthetic paint manufacturers and they are the distributors for that material.

Have you any more questions or ideas that might add to what we have?

Well, if there is nothing else I will turn the meeting over to Major Brown. I think he wants to do a little something on technical questions.

Major Brown: If there are any questions that haven't come up for discussion that you would like answered you can hand them to the stenotype operator and they will be handled through the regular Wire Association channels. Give your name and the question and we will try to get the answers and send them to you by mail.

Chairman Potter: If there are no further questions I want to thank you all for your indulgence in the questions and answers this afternoon and I hope that we can have more of these meetings and really solve some of our problems. I understand there are various lines allied here together and it is rather hard to get to one specific problem. I think the wire men had better have a session to get all the answers to these problems. Thanks again for your attention.

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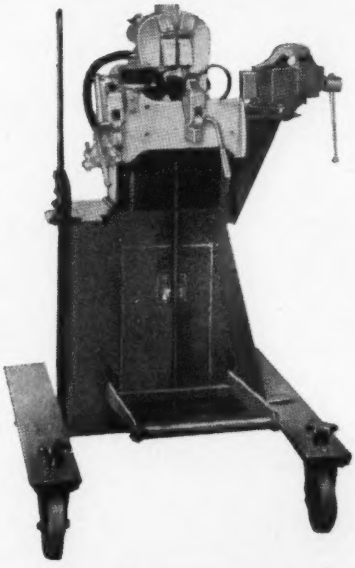

MICRO PRODUCTS COMPANY

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Telephone, State 7468

A FIRM OF BRITISH MANUFACTURERS

NOW WE *ARE* GETTING TOGETHER!

Yes, things are beginning to take shape. You have read our messages in the October and November issues of this journal, and we've had first indications of your interest. Not as many yet as we believe we ought to have (and will get), but just enough for us to see that you have taken our appeal in the right spirit. And that means a great deal to us, because it's a premise of mutual trust and co-operation.

But we don't want to be content with little. We simply refuse to be modest, in our interest and yours. We want to enlist all your help and experience for the establishment of a solid, fruitful, and lasting post-war co-operation.

Maybe there isn't too much you can teach us in high speed spooling, because we know our machine is unique. But we guess we can learn from you in other respects.

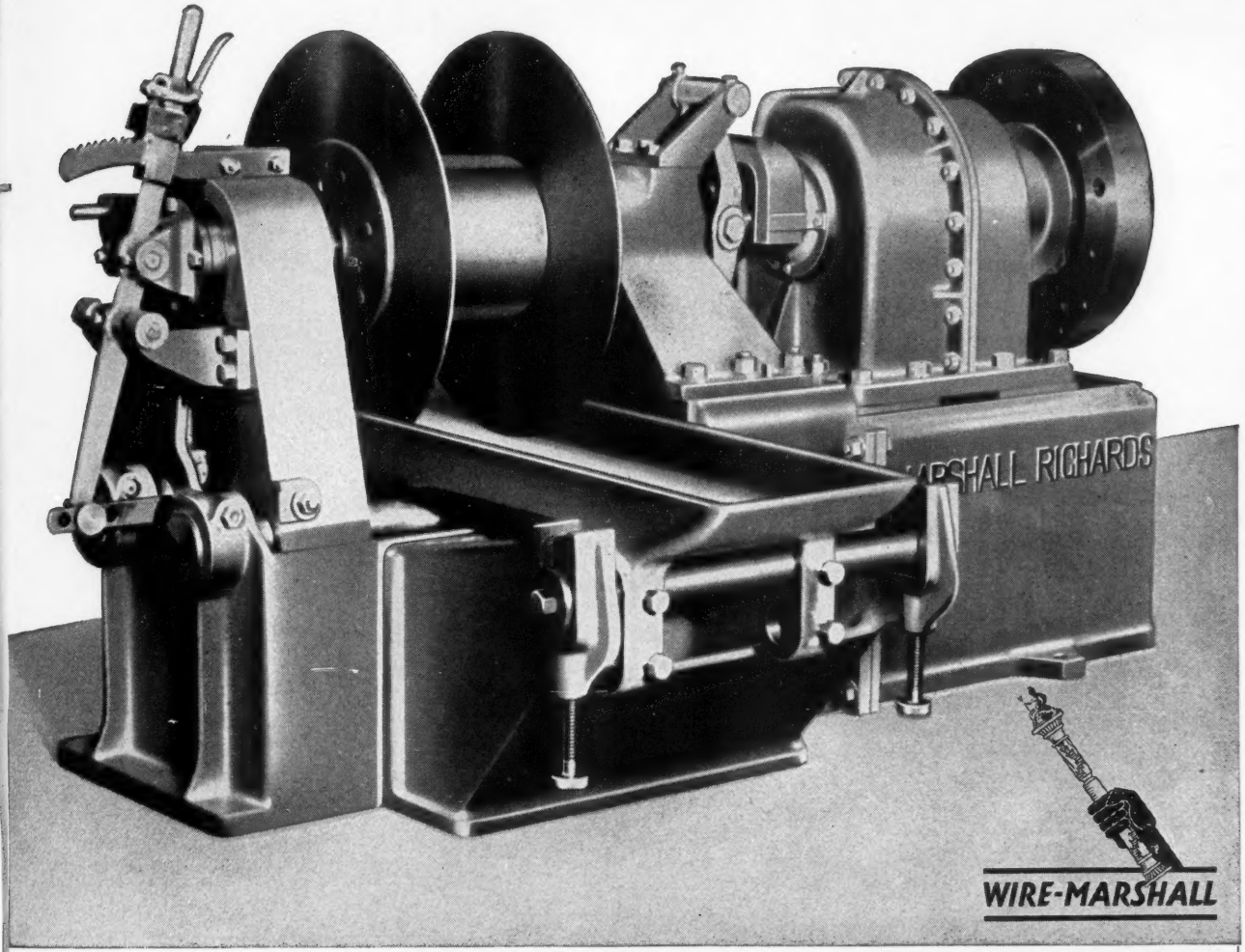
We are waiting to hear more from you. We are watching our mail, and we are looking for air mail letters. Even those, we know, don't travel as fast as your President and our Prime Minister, but we have learnt to be patient. The busier we are answering your letters, the better we shall like it.

If you are interested, write to Marshall Richards Machine Co. Ltd., Gainsborough, England. (The Wire Drawing Machinery Division of Marshalls of Gainsborough.)

MARSHALLS

OF GAINSBOROUGH

TO THEIR AMERICAN COMPETITORS



TYPICAL "MARSHALL RICHARDS" HIGH SPEED SPOOLING MACHINE

Suitable for spooling wire in sizes from 6 to 20 B. & S. Gauge, on reels carrying from 100 to 1,000 lbs. winding at speeds up to 4,500 feet per minute.

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Some Practical Facts About the By-Products Formed in Different Fields of Hot-Dip Galvanizing

By Wallace G. Imhoff,
President, The Wallace G. Imhoff Co., Vineland, New Jersey.

PART II

(Published in Three Parts)

Part I relating to Dross Production in the various fields of Hot Dip Galvanizing was published in the November 1943 issue. + + +

Part III relating to Total By-Products in Hot Dip Galvanizing will be published in the February 1944 issue.

Oxide Skimmings

General Statement:

JUST as there are very definite principles and facts underlying dross formation in the different fields of hot-dip galvanizing, so there are also very definite principles and facts affecting the amount of oxide skimmings made in each field of galvanizing. Two basic principles are of vital importance in considering oxide skimming formation, namely, first, the surface condition of the bath whether (a) totally covered with a slag flux of sal-ammoniac or zinc ammonium chloride; (b) half covered with sal-ammoniac flux, and half uncovered; and (c) entirely bare, or uncovered, with no sal-ammoniac flux used on the bath surface. The second important factor in oxide skimming production is metal and alloy additions to the galvanizing bath. These might be considered the primary conditions that will produce skimmings but there are many other conditions which may be considered as secondary factors that affect the amounts of oxide skimmings produced. The first of these is the kind of articles galvanized, the operating conditions required, the surface area galvanized, the bath temperature, the number of times the bath surface is skimmed over with a skimmer, and a not generally known fact, but the iron content of the galvanizing bath. The average percentage of oxide skimmings made in the various fields of hot-dip galvanizing are shown in Figure 2. We will give a brief discussion on this graph.

THERE is a striking contrast shown in the figures in this graph. On the high side there is the field of Range Boilers and Tanks with the figure of 27.0% of oxide skimmings, and at the other end there is the field of Wire Cloth with only 0.3% of oxide skimmings. The explanation is that in range boilers and tanks the one half of the bath is uncovered. But even this condition is not the real reason for such large quantities of oxide skimmings being produced. The main cause is that the boilers are drawn up out of the bath and allowed to drain back into the bath. Because of the metal and alloy additions to the bath, this draining operation is the basic cause of producing so much skimmings. Attention is called to the fact that while the metal is draining out of the tanks the operator keeps skimming and washing the bath off and away from the boiler surface to keep it clean and free of scurf, dirt, and oxide skimmings which may lodge on the tank surface and be drawn out in the coating. All of these operations are many, and they take a considerable time. The time and the constant skimming and agitation of the bath by the draining zinc from the tank constantly produce oxide skimmings. There is no article that requires this same amount of skimming the bath surface, and the time involved that is necessary to produce a clean high quality hot-dip galvanized range boiler or tank.

+ + +

AT the opposite end is the field of wire cloth that has the drawing side of the bath entirely covered over and thus entirely protected from the action of the air. Only a very small quantity of oxide skimmings are made and these may come at drossing time or times when the bath is uncovered and without flux on it. A brief discussion will be given in regard to the oxide skimmings produced in each

TABLE 2

Average Percentage of Oxide Skimmings Made in the Different Fields of Hot-Dip Galvanizing	
1. Range Boilers and Tanks	27.0%
2. Pipe	9.2%
3. Metal Ware	8.5%
4. Job and Miscellaneous	8.1%
5. Structural	5.2%
6. Malleable Iron Castings	4.5%
7. Pole-Line Hardware	3.6%
8. Wire	1.1%
9. Sheets	0.5%
10. Wire Cloth	0.3%

field of galvanizing as shown on the graph.

✦ ✦ ✦

Range Boilers and Tanks

THIS field is the highest because of the long time of draining operations, the constant skimming of the bath, the metal and alloy additions to the bath, and because the bath is half uncovered and constantly being skimmed and cleared of the oxide scum in order to produce a clean, clear, properly spangled zinc coating finish.

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Pipe

THE field of pipe galvanizing also has a galvanizing bath half covered with slag sal-ammoniac flux and half uncovered. But there is not the metal draining operation that makes so much oxide in range boiler and tank galvanizing. Also only a very small area is skimmed, and the operation is just done before the pipes are withdrawn from the bath.

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Metal Ware Galvanizing

A LARGE amount of oxide skimmings are made in metal ware galvanizing because this field is a surface area field and one half of the bath is always uncovered. Various articles also require a technique of much skimming of the bath to open up a clear area to withdraw the articles through. Scum and scurf and dirt are very undesirable features in this field of zinc coating; the finish must be clean, smooth, bright, and properly spangled. Pipe oxide skimmings are greater in quantity because of the vast differences in tonnages galvanized. A metal ware pot may produce only 40 to 60 tons of metal-ware articles a month; pipe pots will average at least 3 to 4 tons per hour production and many are very much higher up even to 6 and 8 tons per hour.

Job and Miscellaneous Galvanizing

THE figures given in the graph may differ widely from individual cases in any field of galvanizing. This fact is mentioned because in one job galvanizing plant the oxide skimmings had reached the extremely high figure of 34%. It might be mentioned that many range boilers were coated in this plant, and there were other operating conditions that made this very high oxide production figure. The figures listed are those for the entire industry in any one field and have been collected from reliable sources, such as the Bureau of Metal Statistics and the Census Bureau, etc. The variation in the kind of articles galvanized also greatly affect the quantity of oxide skimmings produced.

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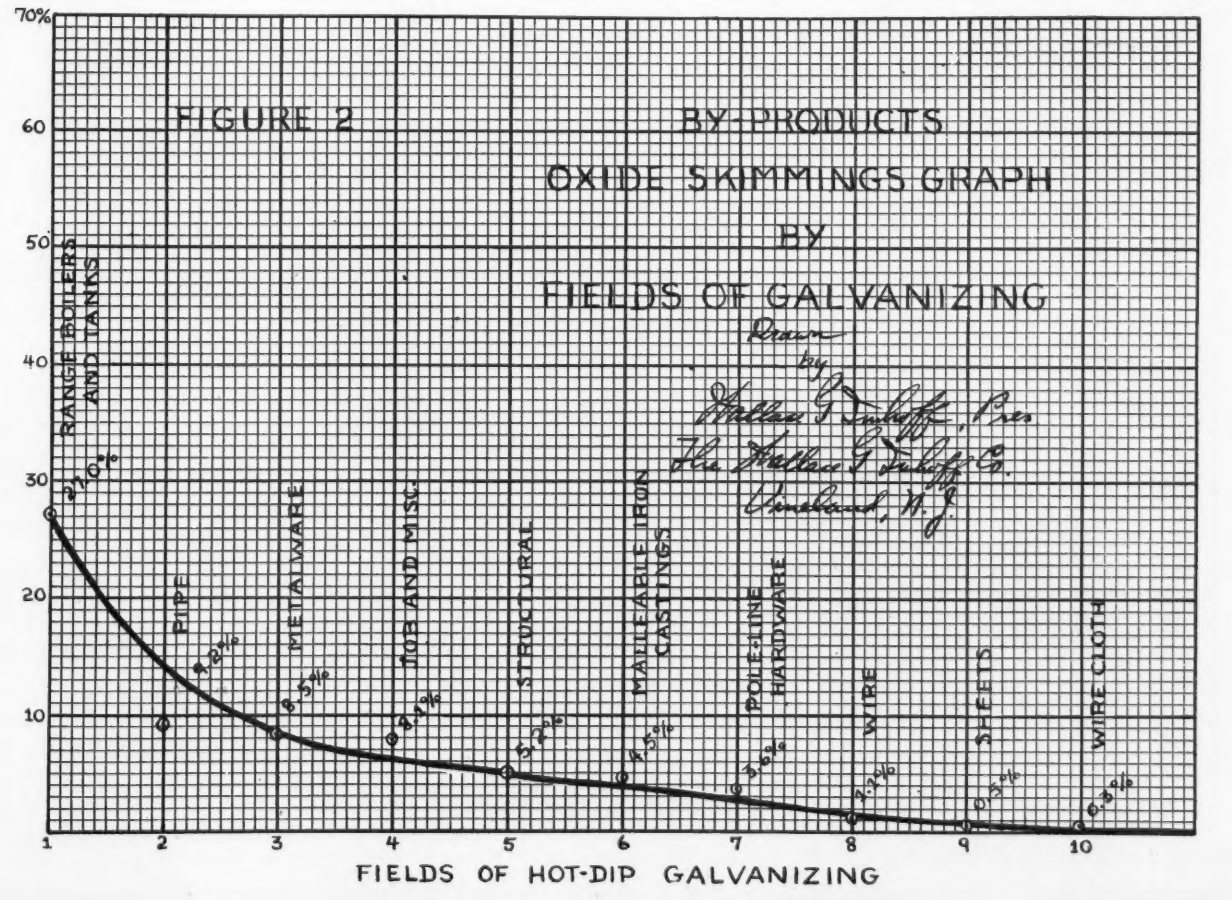
Structural Field of Galvanizing

THE important thing to notice is that we go from the left side



to the right side of the graph, from Range Boilers to Wire Cloth, that we gradually pass from a bath surface that is half uncovered to one which in each field gradually has more and more of the bath surface covered with sal-ammoniac slag flux over the bath. In the structural field the flux is pushed over from one end to the other so that the work can be withdrawn clean. There are two reasons at least why this kind of work is generally water quenched. The one is that the sections are heavy and the coating might burn white, and the second is that the flux is acid, and the water quench will tend dissolve off all these chlorides which are readily soluble in water. The water quench "kills" the spangle finish, but the benefits derived are far more valuable than whether there is a spangled or non-spangled finish.

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Malleable Iron Castings

THIS field of hot-dip galvanizing also carries a light slag flux over the entire galvanizing bath. As with other kinds of work the flux is pushed over and a clean, clear area made so that the work can be drawn up through it. The weight of the sections and washing off the film of acid flux have made it the practice to quench in water in this field also. The idea is merely to set the coating and still permit enough heat to remain to give the work the proper finish, and lustre.

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Pole-Line Hardware

HERE again we see the oxide skimmings gradually decreasing in amount because in the field of pole-line hardware the bath is almost entirely covered with a very thin slag flux at all times. When the articles are withdrawn it is pushed over with the skimmer and they are drawn out through the open space made clear. A large part of this work, in fact most of it is water quenched to set the coating and wash off the acid film of flux.

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Wire; Sheets; Wire Cloth

THERE is very little of the bath exposed in these three fields of hot-dip galvanizing to the direct action of the air during galvanizing operations. About the only oxide skimmings made are when the bath is cleared for drossing or for other purposes allowing the surface to become exposed to the air.

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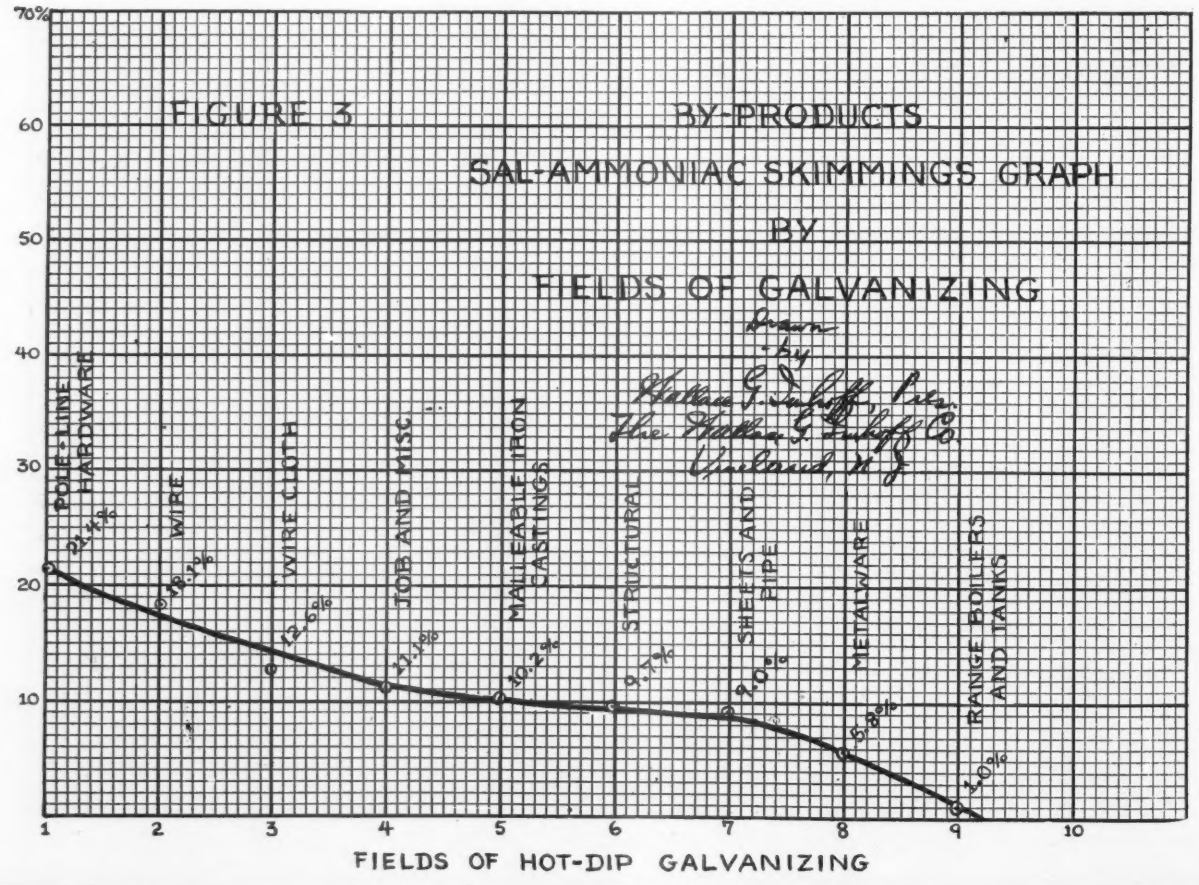
Summary

THERE are three vital surface conditions that have a direct affect upon the quantity of oxide skimmings made. These are when the bath is entirely covered with the slag sal-ammoniac flux, when it is part covered and part uncovered, and when the bath is entirely uncovered. Metal and alloy additions to the bath such as

(*Please turn to Page 794*)



Wire Association Convention Highlights

THE 1943 Wartime Emergency Convention of the Wire Association held at Chicago, Illinois, in October in conjunction with the National Metal Congress now goes on the record as the most successful convention the Association has ever had—both from the excellence of the papers presented and from the viewpoint of attendance.

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IT has become a commonplace in the Wire Association to find each annual convention bigger and better than the last, and this year's meeting followed the rule. Registration was large, and the technical sessions interesting and well attended, and what may be called the extra-curricular activities were eminently satisfactory.

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The Mordica Memorial Lecture

THE outstanding feature of the meeting, The Mordica Memorial Lecture, was presented before a large and attentive audience by **Flint C. Elder,** special research engineer of the American Steel & Wire Company, Cleveland, Ohio, his paper being entitled: "The Wire Drawing Die." Mr. Elder noted the similarity between the phenomena of wire drawing and those of physical testing by tensile stress on which other workers in this field have commented, but unlike them, he was inclined to stress the similarities rather than the differences. It has been the custom to accept the Mordica Lecture without comment. This, however, is the first such lecture on a controversial subject, and perhaps when the paper is published comment will be forthcoming.

Association membership now over 500 ✦ ✦ ✦ 1944 Convention to be held at Cleveland, Ohio, October 16th-20th with Wire Association headquarters at Hotel Carter ✦ ✦ ✦ Mordica Memorial Lecturer for 1944 to be A. M. Reeder, of Jones & Laughlin Steel Corporation ✦ ✦ ✦ E. W. Gundstrom, Rome Cable Corporation, General Chairman and C. A. Litzler, Industrial Oven Engineering Corporation, Chairman Non-Ferrous Division in charge of 1944 Program. ✦ ✦ ✦ ✦

The Annual Luncheon

THE luncheon was featured by addresses by **Captain A. J. Wellings,** Chief of Inspection Administration, Office of Procurement and Material, United States Navy, Washington, D. C., and **Mr. Sigrud Maseing,** Norwegian Consul at Chicago. During the luncheon the guests were most agreeably entertained by **Mr. Carl Mayer,** President of the Carl-Mayer Corporation, Cleveland, Ohio, a member of the Wire Association who presented three songs and proved to be the "hit" of the day. The luncheon session was closed with the presentation of two most interesting motion pictures furnished by the Industrial Incentive Division of the United States Navy.

A. M. REEDER
Metallurgical Engineer
Jones & Laughlin Steel Corp.
Pittsburgh, Penna.
Mordica Memorial Lecturer—1944

✦ ✦ ✦

The Smoker-Dinner

THE Smoker was a "sell-out" and as usual **Gus Zapp,** Chairman of the Committee (and in effect the whole committee), produced the usual above-the-ordinary show.

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A LITTLE surprise feature was received with enthusiastic applause when the Master of Ceremonies called **C. L. McGowan,** Superintendent of the Rod and Wire Mills of the Atlantic Steel Company, Atlanta, Ga., to the microphone. There it was announced that **Clem,** as he is affectionately known to his hundreds of friends, had rounded out fifty years of service in the wire industry in 1943. In his modest, unabashed manner, filled with the dry humor so typical of **Clem,** he acknowledged the tribute paid him and expressed his appreciation of it.

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IF **Gus** continues to cap each year's entertainment with a better one, he will soon have us right out of this world. Tickets were actually sold for standing room only, than which no tribute to the Committee could be higher.

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The Technical Sessions

THE technical sessions of the Wire Association this year fell generally into two classifications,

the first being on wire drawing problems from the mill standpoint and the other being the use of substitute materials in covering wire.

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THE matter of substitute materials in place of those formerly used but now on Government critical lists for covering wire was discussed at some length. Lead base coatings as a substitute for zinc, glass insulations, vinyl resins for wire and cable covering, electrical insulating tapes, and coating wire with synthetic compounds by extrusion, were the subjects of the several papers presented that were devoted to this phase of wire production.

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"Work Done at High Speed or In a Hurry"

By Allan H. Mogensen
Editorial Staff,
"Factory"

IN considering the excellent paper by Mr. Mogensen the thing that impressed everyone the most was the fact that work simplification is the sum total of doing the small things well. The concrete illustrations in the Union Drawn motion picture very clearly illustrated the need for careful thinking on the part of management, processing and engineering, to bring about increased production through work simplification.

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THE speaker presented ably and clearly many ways of securing worker and management cooperation, the development of incentive systems and the financial advantages accruing to both management and employee through acceptance of the principles illustrated.

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"Designing Mills For Government Purposes"

By Paul M. Mueller,
Engineer
Revere Copper & Brass Company,
Rome, New York

THE speaker presented a series of motion pictures showing the development and construction of a wire mill from the plans to the finished mill in operation. Everyone was impressed with the speed and completeness with which the entire building and expansion program was carried out. We were glad to have Mr. Mueller, an old friend who has been A.W.O.L. for for four or five years, back with us. His paper will not be printed.

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"Drawing High Speed Rope Wire"

By John C. Aiken,
Asst. Supt. Rod & Wire Dept.,
Jones & Laughlin Steel Corp.,
Aliquippa, Penna.

THIS was a very clear and understandable paper on improved methods of making rope wire. The paper brought out very clearly the part Tungsten carbide dies and continuous wire drawing machines with cooling arrangements at the block have played in production increases in drawing rope wire. It brought out at the same time that the tensile strength and the torsions of the wire was improved. This paper provoked considerable discussion.

A. R. ZAPP
Manager, Firthaloy Division
Firth-Sterling Steel Company,
McKeesport, Penna.
Chairman, Smoker-Dinner Committee—1944

"The Graphical Solution of Wire Mill Mathematical Problems"

By E. J. Crum
Bethanizing & Galvanizing Depts.,
Rod & Wire Mills
Bethlehem Steel Company,
Sparrows Point, Maryland

HERE was brought before the members of the Association something new and very practical for the man in the mill. The charts found in Mr. Crum's article as published in the October issue of WIRE & WIRE PRODUCTS should find wide use in wire mills throughout this country.

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MR. Crum has done the industry a real service in assembling and presenting his graphs on wire mill calculations. All these problems can be put on the slide rule; each of us probably has one or two that he is constantly using, but for the others he either grinds them out long-hand or wastes hours trying to remember how to play them on his Mannheim. This collection of charts can be clipped together and filed in a handy place and will save a lot of profanity.

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"The Use of Lead Base Coatings as a Substitute for Zinc"

By C. A. Kellogg,
Chief, Dept. of Metallurgy and Inspection,
Continental Steel Corp.,
Kokomo, Indiana

WHILE most of the work and experience discussed by Mr. Kellogg was confined to coating steel sheets, it was pointed out that only minor changes are required to convert either sheet or wire galvanizing equipment for lead alloy coating.

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THE lead alloy discussed was limited to that containing 95% lead minimum; 2½% tin maximum, together with other metals including antimony.

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GREAT stress was placed on the necessity of proper cleaning and fluxing in order to obtain continuity and uniformity of coating and to minimize pin holes.

IT was stated that the weight of coating on wiped and unwiped lead alloy coated wire has been on the order of 0.20 to 0.30 oz. per square foot of wire surface, and 0.60 and 0.70 respectively.

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THERE was considerable discussion of the comparative atmospheric corrosion resistance of lead alloy coatings to zinc coating, and it was claimed that lead alloy has a lower corrosion rate than zinc. However, it was stated that lead alloy protective coatings have not proved satisfactory underground.

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IT was claimed that the lead alloy is considerably harder and stronger than lead, and that several days after its application to ferrous articles the alloy age hardens to the extent that it is quite resistant to abrasion and mechanical damage. The paint-holding properties of lead alloy coatings were claimed to be excellent.

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MR. Kellogg upset some preconceived ideas. He may be 100% right, but judging from the discussion, there are enough doubters to form a Missouri Regional Chapter.

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"Hydrogen Brittleness in Spring Steels"

By Rodman R. Tatnall,
Metallurgical Engineer,
Morgan Works,
Wickwire Spencer Steel Co.
Worcester, Mass.

ROD TATNALL, discussing hydrogen embrittlement, sounded warnings that cannot be too often repeated, as well as giving us some new angles on this extremely aggravating condition. Occluded hydrogen is one of the serious diseases of wire. It is best avoided; if contracted it must be treated promptly and vigorously, for if it ever gets firmly seated it can simulate practically any other disease and lead to great confusion.

IN discussing this paper many interesting experiences were related with reference to this phenomenon. It was pointed out that while in the manufacture of steel wire necessary procedure was well established to prevent this brittleness, that there were many conditions under which this brittleness may develop in connection with the use of the wire.

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ONE wiremaker described an experiment he made. Six closely-wound oil-tempered springs were placed under tension over two posts, mounted on a board. The first board was dipped into a cleaning solution, the second board was sprinkled with the cleaning solution, the third board had no cleaning. The three boards were allowed to stand overnight and were then baked for two hours at 250 to 300 degrees F. Every spring on the first board broke, half on the second board broke, and all on the third board were intact. The only explanation offered was that hydrogen embrittlement may have been formed at two different degrees.

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"Properties and Uses of Vinyl Resins for Wire and Cable"

By G. A. Fowles
Engineer, Plastic Materials Division,
B. F. Goodrich Company,
Akron, Ohio

THIS difficult subject was very ably presented and Mr. Fowles proved himself to be a most able speaker as well as reader of technical papers. This was well brought out in his quick and complete answers to some quite difficult questions presented during the discussion period.

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"Extrusion of Vinyl Compounds in the Wire and Cable Industry"

By H. K. Intemann,
Halowax Products Div.,
Union Carbide & Carbon Corp.,
New York, N. Y.

MR. H. K. INTEMANN was also excellent in the reading of his paper and much credit must be given him for the most excellent charts that were flashed on the screen during the reading of his paper, and for the excellence of the data presented.

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Discussions

THE discussions on all papers together with the Mordica Memorial Lecture will be published in the January 1944 issue of WIRE & WIRE PRODUCTS.

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Announcements at the Wire Association Annual Meeting

IT was announced at the annual meeting that the Wire Association's goal of 500 members has been reached; also that **E. W. Gundstrom**, assistant plant manager, Rome Cable Corporation, Rome, N. Y., will be the general chairman of the program committee for 1944 and **C. A. Litzler,** chief engineer, Industrial Oven Engineering Co., Cleveland, Ohio, chairman, non-ferrous division.

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IT was also announced that the Mordica Memorial Lecture for 1944 will be presented by **A. M. Reeder,** Metallurgical Engineer, Jones & Laughlin Steel Corporation, Pittsburgh, Penna.

✦ ✦ ✦

RECOGNIZING the growing importance of the Pacific Coast in the industrial picture the association will hold its first Pacific Coast Regional Meeting at the Sir Francis Drake Hotel, San Francisco, California, on October 29th and will follow this with a Spring Regional Meeting in Los Angeles.

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IT was also announced that the 1944 Wartime Convention of the Wire Association would be held at Cleveland, Ohio, October 16th-20th, 1944, in association with the twenty-sixth National Metal Conference and that the Exposition would be held in the Cleveland Public Auditorium. Headquarters and all meetings of the Wire As-

(*Please turn to Page 788*)

Recent Developments In Mechanical Spring Design and Testing*

By A. M. Wahl,
Mechanics Department, Research Laboratories,
Westinghouse Electric & Mfg. Company,
East Pittsburgh, Pennsylvania.

PART II

(Published in Two Parts)

Part I pertaining to Helical Spring Fatigue and Static Loading was published in the November 1943 issue. ✦ ✦ ✦ ✦ ✦ ✦

Working Stresses — Helical Springs

AS an example of working stresses used in practice, Table II, used as a basis for design by the company with which the writer is associated, is presented. This table applies to springs made of good quality steel (music or oil-tempered wire, hot-wound springs heat-treated after forming).

TABLE II

Working Stresses for Helical Steel Springs*, psi			
Wire Diameter, inches	Severe Service	Average Service	Light Service
up to .085	60,000	75,000	93,000
.085 to .185	55,000	69,000	85,000
.185 to .320	48,000	60,000	74,000
.320 to .530	42,000	52,000	65,000
.530 to .970	36,000	45,000	56,000
.970 to 1.5	32,000	40,000	50,000

* All stresses based on the use of a factor to take curvature effects into account. For phosphor-bronze springs 50% of these values are used.

IN the application of these figures some exercise of judgment is required in order to determine whether a particular application should be classed as severe or as light service. In general, however, where the spring is subject to continuous fatigue stressing through a considerable range the service may be considered as severe; on the other hand, a spring subject to its maximum load but a few times in its life would be considered under light service.

✦ ✦ ✦

IN general it will be found that the stresses given in Table II are conservative, particularly for springs having the smaller indexes. If a careful analysis of the spring requirements is made, it is frequently possible to use a higher working stress, particularly if a higher grade of material is used.

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Initially Coned Disk (Belleville) Springs

WHERE space is limited in the direction of load application, the use of initially coned disk springs (commonly known as Belleville springs) is frequently of advantage. In addition, by using this type of spring a shape of load-deflection curve which is non-linear may be obtained. For example, if a ratio $h/t = 1.5$ between cone height and disk thickness is used, a load-deflection curve such as shown in Fig. 4, Curve B, may be obtained. This type of curve, known as a "constant-load" type, shows a considerable range of deflection in which the load is practically constant. For certain applications as, for example, springs to produce gasket pressure, such a characteristic is very use-

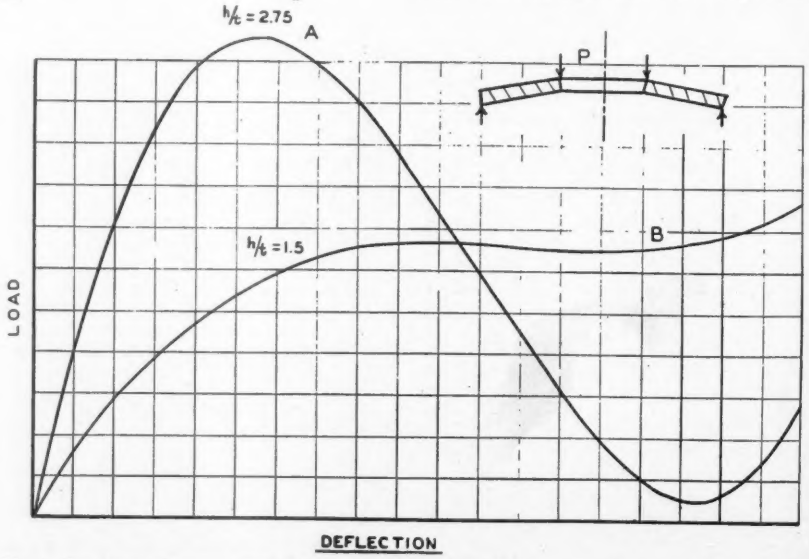

Fig. 4. Two types of curves obtainable by using Belleville Springs.

* Paper presented at summer session for Mechanical Engineering Teachers sponsored by the S.P.E.E. and the A.S.M.E., Purdue University, June 29-July 3, 1941.

ful. By increasing the ratio h/t to 2.75, Curve A of Fig. 4 is obtained. This type of curve has a snap-action characteristic, i.e. beyond a certain peak load the load decreases as the deflection increases. In addition a wide variety of intermediate shapes may be obtained by varying the h/t ratio.

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A VERY interesting analysis of this type of spring has been carried out by **Almen and Laszlo**[15]. By assuming that, during deflection, radial cross-sections of the spring rotate without distortion, it is possible to derive formulas for calculating deflections and stresses in this type of spring, the non-linearity of the load-deflection characteristic being taken into account. The practical application of the formulas given by **Almen and Laszlo** is facilitated by charts published by the writer[16]. By using the curves given in this article the design of Belleville springs having any desired shape of load-deflection characteristic may easily be carried out.

✦ ✦ ✦

A FURTHER simplification of the formulas for the constant-load type of spring (Curve B, Fig. 4) is possible[17]. This type of spring will show practically a constant load from a deflection equal to .8 the thickness to a deflection of 2.25 times the thickness. Under these conditions, for a given maximum stress the required disk thickness and the constant load are given by

$$P = CD^2 \qquad (2)$$

$$t = D/K \qquad (3)$$

where C and K depend on the ratio D/d between outer and inner diameter and on the maximum stress. Taking the maximum deflection equal to 2.25 t, the curves of Fig. 5 and 6 have been plotted between maximum stress and values of C or K, for various ratios D/d. In working up these curves, steel springs with a modulus of elasticity $E = 30 \times 10^6$ psi were assumed. For springs of smaller size (say under ¼ inch thick) a peak stress value of 200,000 psi as calculated by these formulas has

TABLE III

Constant Load Belleville Spring Proportions*

$\frac{D}{d} = \frac{\text{Outside Dia.}}{\text{Inside Dia.}}$	Spring Thickness t, inches	Maximum Deflection (2.25 t)	Constant Load P, lb.
1.25	D/80	D/35.5	14.5 D^2
1.5	D/67.4	D/29.9	18.5 D^2
2 to 2.5	D/63.8	D/28.3	17.4 D^2

* Based on 200,000 psi peak stress.

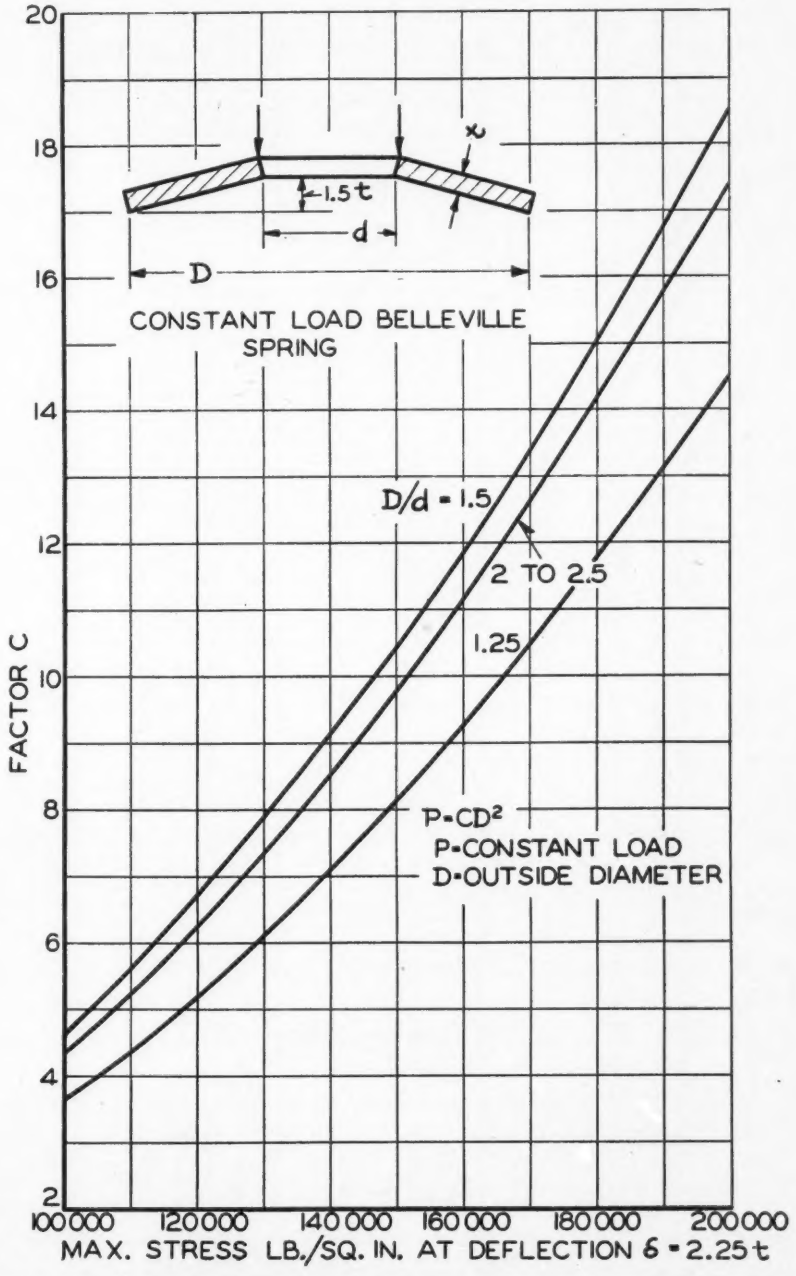

Fig. 5. Curves for calculating constant load Belleville Springs. (Note: These curves apply only if the thickness t is chosen in accordance with Fig. 6.) ✦ ✦ ✦ ✦ ✦

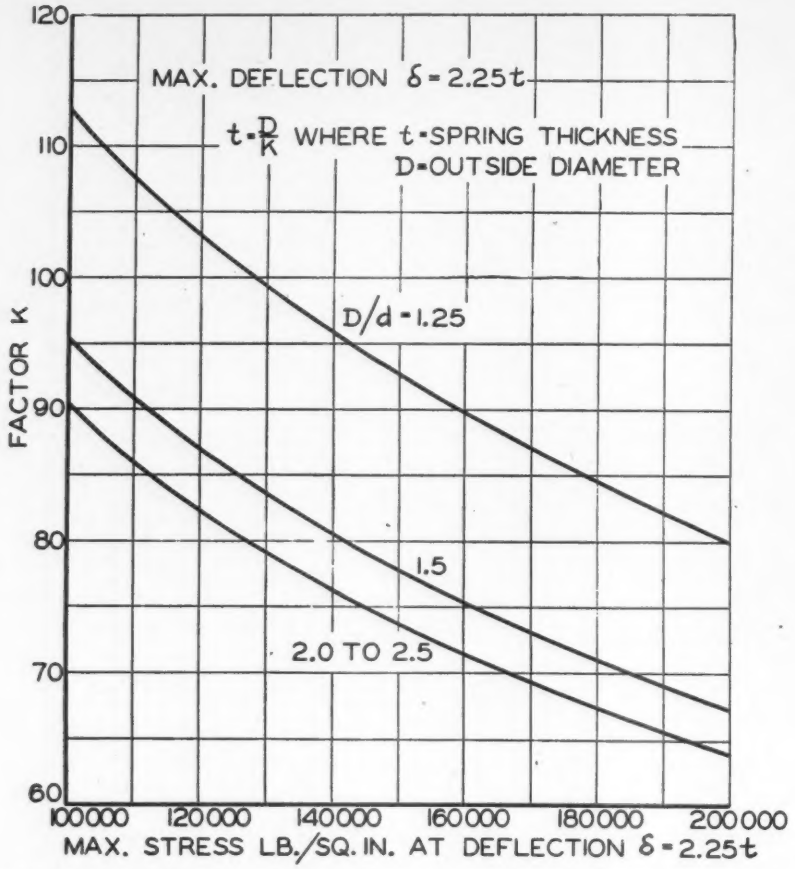

Fig. 6. Curves for determining thickness for constant load Belleville Springs. (h = 1.5t) ✦

been found permissible, providing fatigue conditions are not present[15].

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TAKING a stress of 200,000 psi as a basis, the formulas reduce to those given in Table III.

✦ ✦ ✦

BY this means the design of a constant load spring is reduced to a relatively simple procedure.

References

(1) "Stresses in Heavy Closely-Coiled Helical Springs", Trans. A.S.M.E. 1929, APM 51-17. See also "Die Berechnung von Schroubenfedern" by O. Gohner, Zeit. VDI, Mar. 12, 1932.

(2) "Relation of Wahl Correction Factor to Fatigue Tests on Helical Compression Springs" by F. F. Zimmerli, Trans. A.S.M.E., Jan. 1938, p. 43.

(3) See writer's paper "Analysis of Effect of Wire Curvature on Allowable Stresses in Helical Springs", Journal of Applied Mechanics, March 1939, p. A-25 for a further discussion of this problem.

(4) "Permissible Stress Ranges for Small Helical Springs" by F. P. Zimmerli, University of Michigan Engineering Research Bulletin No. 26.

(5) "Abstract of Progress Report No. 3 on Heavy-Helical Springs" by C. T. Edgerton, Transactions A.S.M.E., October 1937, p. 609.

(6) "Fatigue Characteristics of Helical Springs" by J. B. Johnson, Iron Age, March 15, 1934, p. 12.

(7) A summary of available data on endurance limits of springs and spring materials is given in an article on "Spring Materials" by the writer, Machine Design, October 1940, p. 46.

(8) Batson and Bradley, Proc. Inst. of Mechanical Engineers, 1931, V. 120, p. 301.

(9) "How Shot Blasting Increases Fatigue Life" by F. P. Zimmerli, Machine Design, Nov. 1940, p. 62. Also, "Improving Fatigue Strength of Machine Parts", by J. O. Almen, Machine Design, June 1943, p. 124.

(10) "Calculation of the Elastic Curve of a Helical Compression Spring" by H. C. Keysor, Trans. A.S.M.E. May 1940, p. 319.

(11) "Working Stresses" by C. R. Soderberg, Trans. A.S.M.E., 1933, APM 55-16.

(12) See writer's article "Design of Springs Under Static Loading", Machine Design, June 1941, for a further discussion of this problem.

(13) See reference of Footnote 12 for further details of the analysis.

(14) "Effect of Temperature on Coiled Steel Springs subject to Various Loadings" by F. P. Zimmerli, presented at the 1940 Annual Meeting of the A.S.M.E.

(15) "The Uniform Section Disk Spring" by Almen and Laszlo, Trans. A.S.M.E., May 1936, p. 305.

(16) "Design and Selection of Disk Springs", Machine Design, Mar. 1939, p. 32.

(17) The method was suggested by Mr. R. C. Bergvall of the Westinghouse Company.

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✦ GOVERNMENT WIRE PRODUCTION INFORMATION ✦

Enamel Wire Naphtha

CONSIDERATION is being given by the War Production Board to placing enamel wire naphtha (E. W. Naphtha) under allocation. Its distribution is now controlled by specific directives, supplies having been frozen on September 29, 1943. Enamel wire naphtha is a heavy fraction from solvent naphtha used in the manufacture of enamel for resistance and magnetic wire.

✦ ✦ ✦

WITH supply of this product far short of requirements, military considerations have made it necessary to direct all of the output to the manufacture of Formvar Enamel, used for enameling magnet wire going into many types of electrical equipment in the war program.

PRESENT supply is insufficient to direct any into the field of oleoresinous enamels. It is also insufficient to direct any for use in thinning the enamel prior to application on bare wire.

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THUS far, it is believed no undue hardship has been encountered under the present procedure. But, if demand continues to mount, it is planned to put the commodity on allocation under Oder M-150.

✦ ✦ ✦

Production Requirements of Controlled Materials Producers

PRODUCERS of steel in controlled material form may use the AA-1 preference rating assigned under CMP Regulation No. 8 to obtain the use of facilities as well as for the acquisition of materials, the War Production Board announced recently.

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THIS action, contained in CMP Regulation No. 8, as amended October 27, conforms to Priorities Regulation No. 3 which permits the use of preference ratings to get the processing of raw materials which will be delivered.

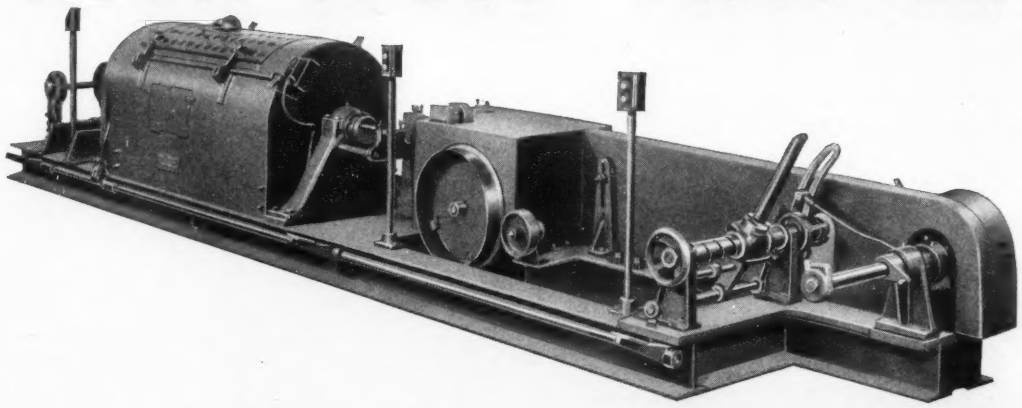
✦ ✦ ✦

WPB Amends Order M-1-i Liberalizing Use of Aluminum and Copper

ACTION to increase the permitted uses of aluminum which will have the effect of releasing other critical metals, particularly copper, now used in many of these products, was taken in a revision of Order M-1-i.

(*Please turn to Page 784*)

HIGH SPEED TWISTER



The illustration above is a two conductor single bay machine designed for twisting together flexible wires such as lamp cords, assault and field telephone cables, portable power cables, and other light cords. These machines will twist asbestos, braid, rubber, and compound covered materials.

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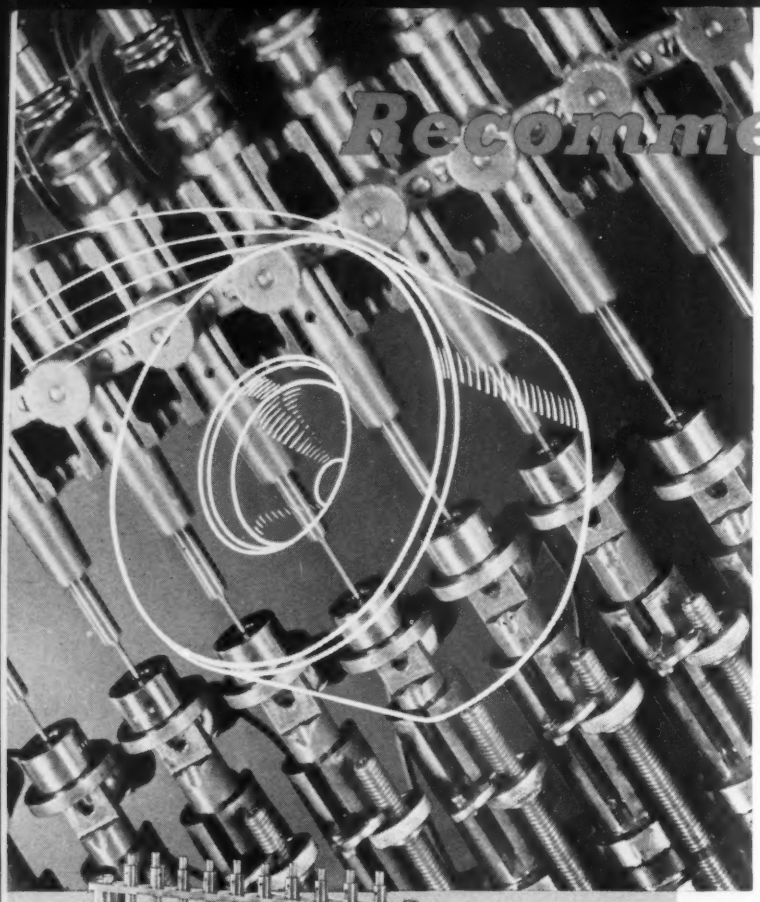
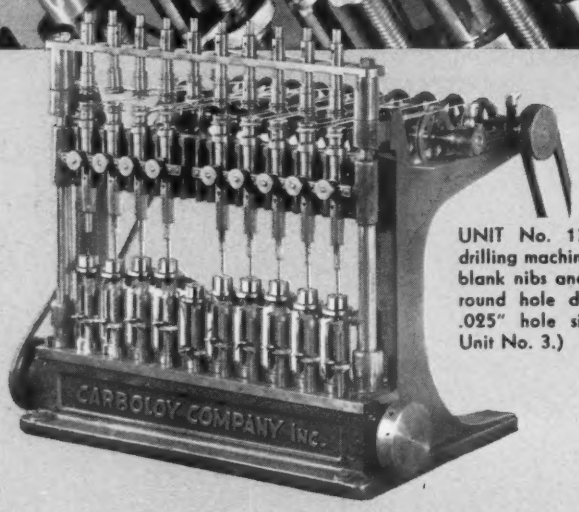


PROPER EQUIPMENT and technique for the finishing and servicing of carbide dies is vital to their successful use in the mill. So important is this phase of carbide die application that Carboloy Die Service includes complete recommendations for suitable equipment and personal assistance in its correct installation and use in the die room. Where necessary, Carboloy Company has designed—or cooperated in the design of suitable equipment and made it available through our organization.

In those cases where existing standard equipment has proven to be satisfactory for adaptation to carbide die maintenance, such standard equipment (marked *) has been

CARBOLO (TRADEMARK)



UNIT No. 13—(10 spindle drilling machine.) For piercing blank nibs and rough drilling round hole dies up through .025" hole size. (Finish on Unit No. 3.)

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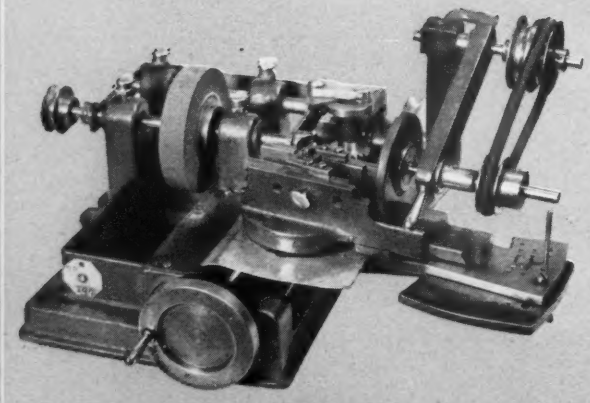
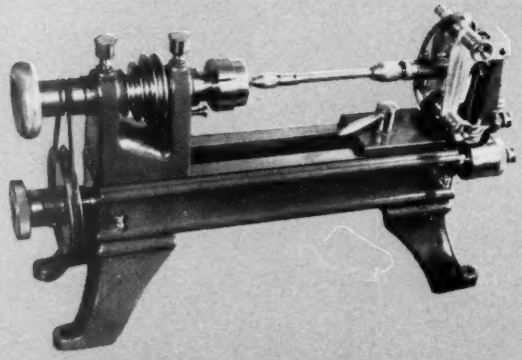
Detailed specifications of all special equipment shown, plus all accessories required, are contained in catalog D-114, sent on request.



UNIT No. 14—For grinding steel lapping pins assembled in holders, for use in Unit No. 13.

UNIT No. 3—Roos Semi-Automatic Polisher for lapping bearing and polishing approach angle of round hole dies up through .250" hole size.



UNIT No. 2—Roo... ping ...chine for ... hole... up throu... (Lig...ty Mach... suit... up to hole... .10... finish on U...

...ent for Finishing and Servicing ...nd Shapes of Carbide Dies . . .

been recommended and may be purchased direct from the manufacturer.

Carboloy representatives are glad at all times to assist you in all problems involving carbide die maintenance. It is an important part of Carboloy Die Service "beyond the sale". A training course is also available to your die room men, without charge, at our Detroit plant, where completely equipped "school rooms", in charge of experienced instructors, are maintained.

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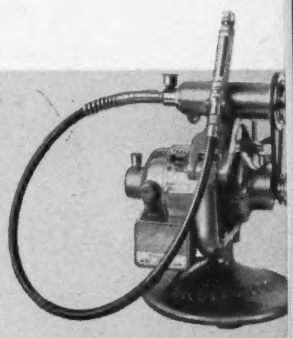
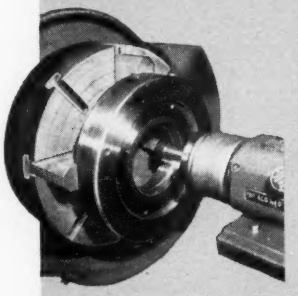
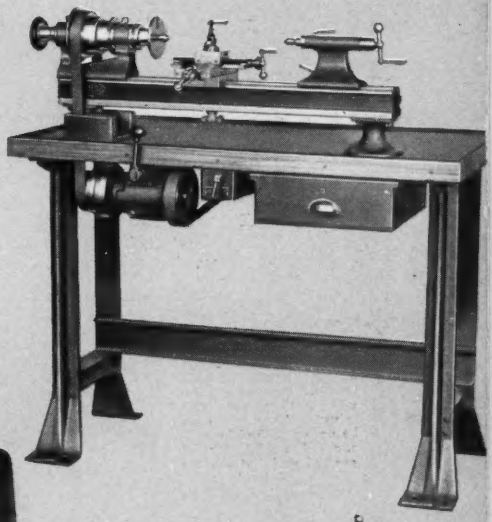


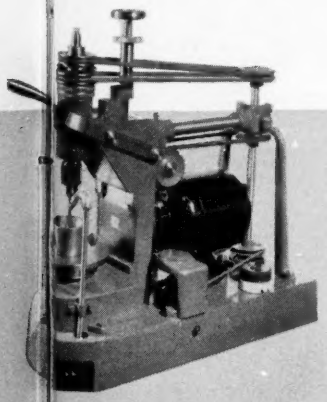
*UNIT No. 4—For polishing round hole dies over .250" hole size. *Kellerflex Light Duty Flexible Shaft Lapping Machine. (*Heavy Duty Machine also available. Unit No. 5.)



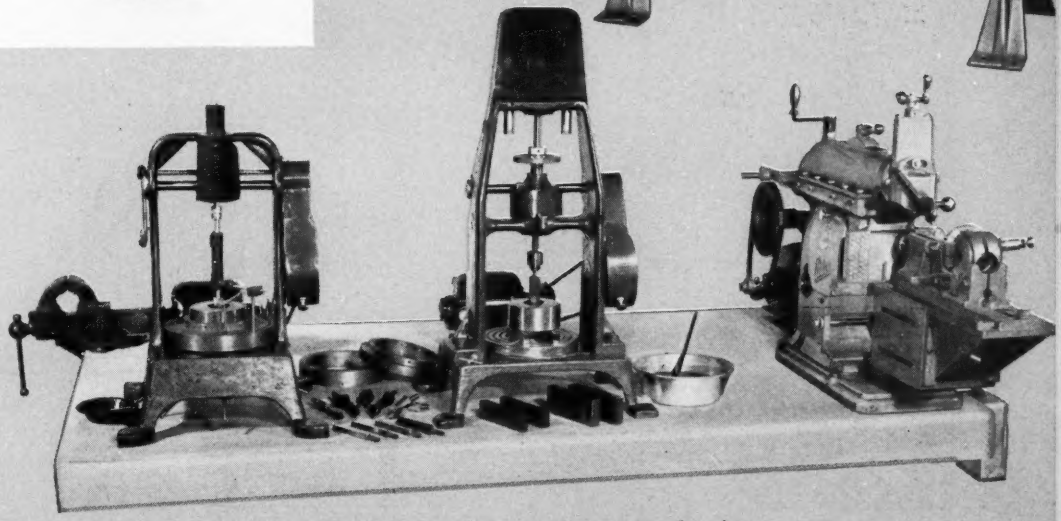
*Internal grinding machine. For grinding I.D. of large ammunition dies (over 20 mm.) (Units Nos. 4 or 5, or similar hand grinders used for final polishing.)



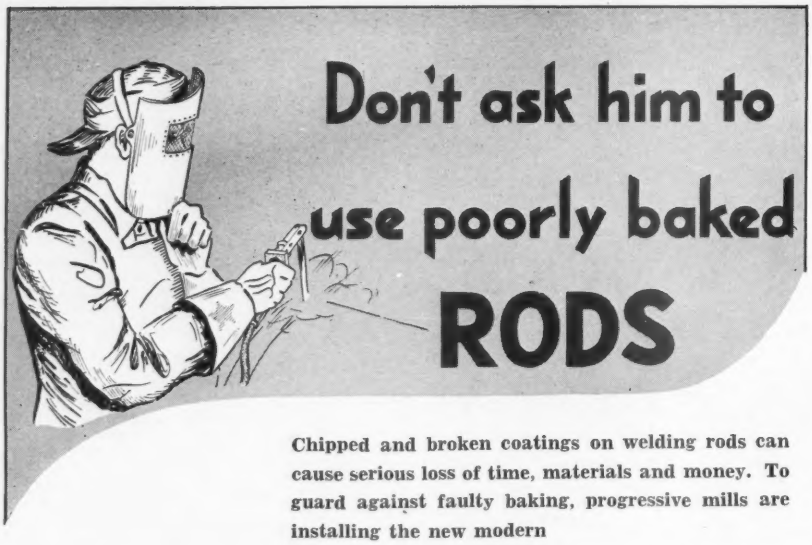
*UNIT No. 9—For diamond boring and lapping round hole dies, hole sizes over .250", including ammunition dies up through 20 mm. (Finish, using Units Nos. 4 or 5.) (Precision lathe, capacity up to 6" O.D. casing sizes. For larger casings, use an engine lathe.)



UNIT No. 2—Roos Heavy Duty Lapping Machine for rough drilling round holes up through .250" hole size. (Light Duty Machine also available, suitable up to hole size approximately .100" finish on Unit No. 3.)



For finishing and servicing all shape dies. Complete assembly consists of shaper for producing laps, die sizing machine, die shaping machine and (not shown) *Kellerflex Lapping Machine with reciprocating lapping attachment.



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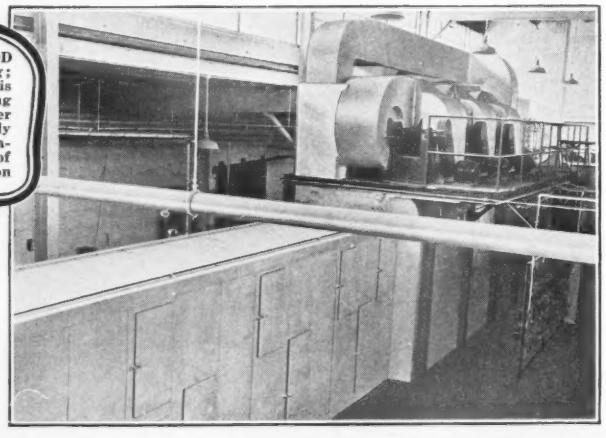

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Government Wire Production Information

(*Continued from Page 781*)

ALL the uses permitted will be in machines, tools and other items which contribute directly to the war program.

✦ ✦ ✦

Scheduling Orders Correlated

THE War Production Board announced recently that Limitation Order L-203, covering electrical indicating instruments, has been amended to conform the order with General Scheduling Order M-293, as directed by the Orders and Regulations Bureau. As the result of the recent amendment of Order M-293, electrical instrument scheduling is now being done under two orders, and this amendment will provide the proper correlation and cross reference.

✦ ✦ ✦

Order L-193 Revised

PROVISIONS requiring authorization of engineering services, bids and estimates, and placement of purchase orders are removed from Order L-193 (Conveying Machinery and Mechanical Power Transmission Equipment) as amended by the War Production Board. This equipment is now being scheduled under General Scheduling Order M-293. Prospective purchasers are no longer required to file Form WPB-1593 (formerly PD-681).

✦ ✦ ✦

Wire Substitute for Manila in Maritime Uses

FACING a critical shortage of manila and sisal fiber stocks, the Maritime Commission has embarked on a strict conservation program, virtually eliminating manila and substituting wire, cotton, and jute wherever possible for mooring lines, tow lines, and other ship and loading rigging

Zinc Conservation Order M-11-b Amended

THE War Production Board has issued Zinc Conservation Order M-11-b, as amended, adding a number of general exceptions to restrictions formerly imposed by List A, and also making a number of substitutions for items formerly appearing on List A.

✦ ✦ ✦

Restrictions Modified On Use Of Chromium and Nickel in Wire

RESTRICTIONS on the chromium and nickel content of extension lead wire for instrument ends were modified by the W.P.B. through issuance of an amended Conservation Order L-134 (instruments, valves and regulators used in industrial processes). The paragraph on extension lead wire specifications now reads: "The size of wire, except for wire used on aircraft or for super-heater pyrometers on locomotives, shall be limited to No. 14B and S gauge, or smaller."

✦ ✦ ✦

THIS relaxation of specifications will create a potential additional use of more than 25 tons of alloy material a year.

✦ ✦ ✦

WPB Modifies Solder Order

THE War Production Board recently issued General Preference Order M-43, as Amended, relaxing restrictions on the tin content of solders where it has been found that higher tin content is necessary. Previously this higher content could be used only upon the granting of appeal. But under the amended order specific provisions permit higher tin content, in some cases above 21 per cent, for certain solders, thus reducing paper work.

✦ ✦ ✦

Diamond Dies

THE War Production Board recently issued Amendment 1 to General Conservation Order M-181 eliminating monthly reports from consumers of non-critical size diamond dies. These consumers will hereafter file reports once a year.

Helping Build the "Arteries" of Our Flying Fortresses . . .

KEYSTONE *Wire*

Into each Flying Fortress goes *six miles* of wire "arteries" that make up the intricate electrical system. This is just *one* reason why wire mill production is "drafted" for the duration . . . literally *thousands* of other products for war use are made from Keystone wire, rods, and billets.

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Special Analysis Wire for All Industrial Uses

SAMSON SPRING WIRE — KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

A little scrap *today* can end the BIG SCRAP *tomorrow.*

Outstanding Personalities of the Wire Industry

Wickwire Spencer Steel Names Konselman Advertising Manager

THE appointment of **Charles B. Konselman,** as Advertising Manager of the Wickwire Spencer Steel Company was announced recently.

✦ ✦ ✦

MR. KONSELMAN succeeds **George L. Randall,** recently commissioned a Lieutenant (j.g.) in the U.S.N.R. and now stationed temporarily at the Naval Air School, Quonset Point, Rhode Island.

✦ ✦ ✦

PRIOR to joining Wickwire Spencer and for the past six years, Mr. Konselman was associated with the Royal Typewriter Company, the last three years of which as Sales Promotion Manager. Mr. Konselman was graduated from Columbia University in 1931, after which he studied Business Administration in the Graduate School and has continued his specialized business study and practice since this time.

CHARLES B. KONSELMAN

MR. KONSELMAN will be located at the Company's home office, 500 Fifth Avenue, New York 18, N. Y.

✦ ✦ ✦

E. A. Murray, Asst. Mgr., Manufacturers Sales Dept., American Steel & Wire Company

E. A. MURRAY has been appointed assistant manager of the manufacturers sales department in the Chicago sales office of the American Steel & Wire Co., subsidiary of U. S. Steel Corp.

✦ ✦ ✦

MR. MURRAY started working for the American Steel & Wire Co. in May, 1934, as a sales correspondent in the manufacturers sales department in Chicago. In June, 1935, he was transferred to St. Paul, Minn., as a salesman and in October, 1941, he was moved

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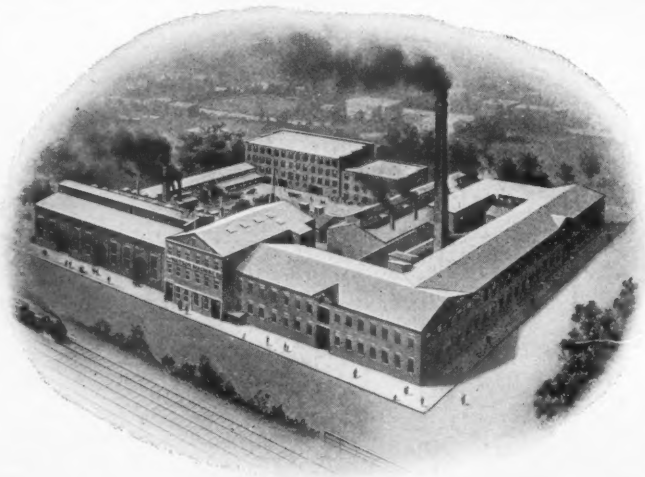

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to Cleveland as supervisor of the priorities division of the Cleveland general sales office which position he has held to the present itme.

✦ ✦ ✦

Newbery Appointed Sales Manager Detrex Corporation

W. F. NEWBERY has been appointed Sales Manager of the Industrial Division of Detrex Corporation, Detroit, Michigan.

✦ ✦ ✦

MR. NEWBERY started with Detrex in 1934 as sales and service engineer in the northeastern states, later serving as Eastern Region Manager for several years. More recently he was South Central Region Manager with headquarters at Dayton, Ohio.

✦ ✦ ✦

William R. Moore, Vice President, Norton Company

WILLIAM R. MOORE has been made a Vice President of Norton Company, Worcester, Mass. He will be in Charge of National Accounts, Handling Ore and Grain Sales to Grinding Wheels and Abrasive Paper and Cloth Manufacturers. He will also be in charge of Sales of Refractories, Boron Carbide and Pulpstones.

✦ ✦ ✦

MR. MOORE, a native of Pennsylvania, came to Worcester following his graduation from Pennsylvania State College with the degree of Electro-Chemist. Following the sales training course, he was assigned to the Sales Engineering Department and later was advanced to Assistant Sales Engineer, Sales Engineer, Assistant Sales Manager of the Abrasive Division, Director of Market Research, Sales Manager and in 1939 he became General Sales Manager, Abrasive Division.

✦ ✦ ✦

L. F. McGlincy, Asst. Mgr. Oprs., American Steel & Wire Co., Pittsburgh District

L. F. McGlincy has been appointed assistant manager of operations, Pittsburgh district of American Steel & Wire Co., subsidiary of U. S. Steel Corp. **Loren J. Westhaver** has been named general superintendent of the Donora (Pa.) Steel & Wire Works succeeding Mr. McGlincy.

✦ ✦ ✦

Frank Nickerson

FRANK NICKERSON, manager of sales in the San Francisco district for the Bethlehem Steel Co., died recently. After service in the last war he joined the Midvale Steel & Ordnance Co. in San Francisco and became associated with Bethlehem in 1922.

✦ ✦ ✦

A. Minch, Vice President, Electric Auto-Lite Company

ARTHUR MINCH has been appointed vice president of the Electric Auto-Lite Co., of Toledo, and has been placed in charge of the company's battery division. He has been with the company since 1914 and recently has been general manager of the company's wire division in Port Huron, Mich.

Wire Association Convention Highlights

(*Continued from Page 777*)

sociation will be at the Hotel Carter.

✦ ✦ ✦

PERHAPS the best summary of this year's Convention from the Wire Association viewpoint is presented in a letter from **Captain A. J. Wellings** of the United States Navy which follows:

"Mr. R. E. Brown,
Executive Secretary
The Wire Association
300 Main Street
Stamford, Connecticut

My dear Mr. Brown:

For over twenty years I have been attending Metal Conventions but the last one was really the best. The opportunity you afforded me to meet and speak to the members of The Wire Association was a privilege and honor I greatly appreciate.

Your members are doing excellent work for the Navy and I feel certain they will continue in the same manner for the duration. Due to unexpected changes in the strategic situation, our requirements may shift from one type to another on short notice. Although we work day and night to keep ahead of the requirements, we are not astrologers and our best efforts are being put forth to accomplish our task in the most efficient manner.

To you and your staff I shall always be indebted for your many kindnesses and courtesies.

Sincerely yours,
(Signed)
A. J. WELLINGS,
Captain, U.S.N."

✦ ✦ ✦

New Members of the Wire Association, October 1, 1943 - December 1, 1943

ANDERSON, H. W., Pres. & Gen. Mgr., Fidelity Machine Company, Philadelphia, 24, Penna.

BLESCH, CHAS. A., Mgr., Ind. Furnace Division, Natural Gas Equipment, Inc., San Francisco, Calif.

CALDWELL, JOHN C., Tech. Serv. Mgr., The Arco Company, Cleveland, 4, Ohio

CALVERLEY, H. R., Metal Work. Spec., Shell Oil Company, Lubricants Depts., New York, 50, N. Y.

CARLSON, JULIUS, Gen. Foreman, Canadian Steel Corp., Ltd., Ojibway, Ont., Canada

DAVIES, EDW. J., Gen. Supt., Driver-Harris Company, Harrison, New Jersey

DUNHAM, L. H., Asst. Mgr., Met. Dept., American Steel & Wire Co., Cleveland, 13, Ohio

EARHART, OWEN, Gen. Sales Mgr., Fidelity Machine Company, Philadelphia, 24, Penna.

FERGUSON, D. H., Fabricating Supt., Aluminum Company of Canada, Ltd., Shawinigan Falls, P. Q., Canada

HALL, C. E., Asst. Plant Engr., National Lead Company, Barber, New Jersey

HAWLEY, JOHN S., Supt., California Wire Cloth Corp., Oakland, California

HOLCOMBE, ALBERT S., Mgr., Neil C. Potter Company, Newark, N. J.

KAFFINE, H., Chief Mech. Engr., Fidelity Machine Company, Philadelphia, 24, Penna.

KARNS, PAUL A., Supt., Round & Flat Wire Div., John A. Roebling's Sons Co. Trenton, New Jersey

LIEBERMAN, A. A., Ch. Engr., Petroleum Marketing Co., Los Angeles, 11, Calif.

LINDSTROM, F. G., Supt., Wickwire Spencer Steel Co., Palmer, Mass.

MARSH, C. R., President, The Malin & Company, Cleveland, 13, Ohio

MEYER, FRED W., Wire Mill Supt., W. S. Tyler Company, Cleveland, Ohio

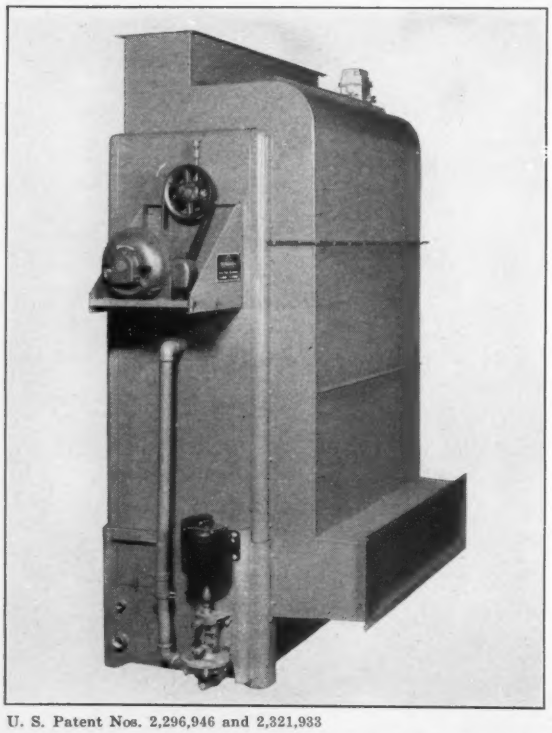
MINICH, H. D., President, Tensolite Company, North Tarrytown, New York

MUNTWYLER, F. C., Vice Pres., Wire Sales Company, Chicago, Illinois

OTTON, ALFRED S., Mgr., Industrial Wire Cloth Div., Robins Conveyor, Inc., Passaic, New Jersey

ROE, ERNEST A., Manager, Coast Wire Company, San Francisco, Calif.

RUSSETSKY, G. K., Engr., Soviet Govt. Purchasing Comm., Washington, 10, D. C.



U. S. Patent Nos. 2,296,946 and 2,321,933

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673 Ontario St., Buffalo, N. Y.
District Engineers in Principal Cities

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National Lead Co.,
Barber, New Jersey
SCOTT, R. M., Chief Engr.,
New England Butt Company,
Providence, Rhode Island
SEMENOV, NIKOLAI, Engr.,
Soviet Govt. Purchasing Comm.,
Washington, 10, D. C.
SPALDING, L., Wks. Mgr.-Dir.,
Hipprum Wires, Ltd.,
Hipperholme, Halifax, England
STEELE, W. A., Gen. Mgr.,
Wickwire Spencer Steel Co.,
Buffalo, 7, New York
THOMPSON, J. R., Mgr., Met. Dept.,
American Steel & Wire Co.,
Cleveland, 13, Ohio
UPDIKE, F. TITUS, Engr.,
John A. Roebling's Sons Co.,
Trenton, N. J.
WEBER, ELMER C., Die Designer,
Firth-Sterling Steel Co.,
McKeesport, Penna.
WEIL, A., Supt. Metal Div.,
National Lead Company,
Barber, New Jersey
WOOD, JAMES C., Supt. Wire Mill,
Columbia Steel Co.,
Pittsburg, Callifornia

✦ ✦ ✦

Pacific Coast Regional Meeting

THE first Regional Meeting of the Pacific Coast membership of The Wire Association was held at the Sir Francis Drake Hotel, San Francisco, California, on Friday, October 29th, 1943 with twenty-five members and guests present.

✦ ✦ ✦

PRECEDING the luncheon there was an informal get-together session for the purpose of getting acquainted with each other.

✦ ✦ ✦

AT the luncheon, **Emerson Spear,** Vice President of the Pacific Wire Rope Company, Los Angeles, California, presided and the speaker was **Major Richard E. Brown,** Executive Secretary of the Wire Association who spoke on "The Wire Association and Its Activities."

✦ ✦ ✦

FOLLOWING the luncheon, at the technical session, **Mr. Earl R. Potter,** Superintendent, California Wire Cloth Corp., Standard Wire Div., South San Francisco, California. was chairman of the session. The paper presented was written by **R. R. Preston,** formerly wire mill superintendent of Page Steel & Wire Division of American Chain & Cable Company, and now Die Service Engineer of the Carboloy Company, Pittsburgh, Penna. Due to unforeseen circumstances Mr. Preston was unable to be present and the paper was adequately presented by **Ray D. Mack,** Pacific District Manager of Carboloy Company, Inc., Huntington Park, California.

✦ ✦ ✦

FOLLOWING the paper there was a short discussion which will be found printed in this issue, immediately after the paper.

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THE meeting concluded with the showing of two motion pictures furnished by the Industrial Incentive Division of the United States Navy, one entitled "This is Guadalcanal" and the other "December Seventh."

✦ ✦ ✦

AT the meeting it was decided to hold a Spring meeting at Los Angeles, the date to be determined later, and for the present to conduct these meetings in a similar manner to the other regional meetings of the Association.

(*Please turn to Page 790*)

YOU boost your tonnage with TECO Cemented Carbide because it holds accurate size and smooth finish for longer runs. Here's why:

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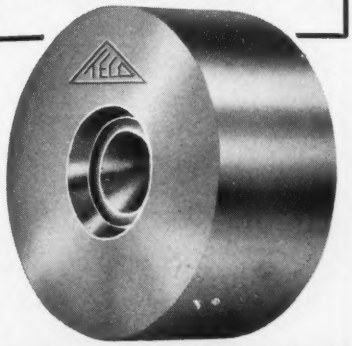

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Branch Office: 2906 Euclid Avenue, Cleveland, Ohio.
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TECO Pioneers in Tungsten Carbides for over a Quarter Century **CARBIDE DIES**

Wire Association Convention Highlights

(*Continued from Page 789*)

THE Committee in charge consisted of

Earl R. Potter, Superintendent
California Wire Cloth Corp.,
Standard Wire Division,
South San Francisco, California

CHAIRMAN

Ray D. Mack, Pacific District Mgr.,
Carboloy Company, Inc.,
Huntington Park, California

Richard E. Brown, Executive Secretary
"THE WIRE ASSOCIATION"
Stamford, Connecticut

Emerson Spear, Vice President
Pacific Wire Rope Co.
Los Angeles, California

Harry T. Hartwick, Engr.,
Firth-Sterling Steel Company,
Los Angeles, California

✦ ✦ ✦

THE present West Coast membership of the Wire Association follows:

BEARD, READE M., Staff Asst.,
General Supt. Office,
Columbia Steel Co.,
Pittsburg, Calif.

BLESCH, CHAS. A., Mgr.,
Ind. Furnace Div., Natural Gas Equipment, Inc.,
899 Bryant St., San Francisco, Calif.

DAVIS, K. H., President,
K. H. Davis Wire & Cable Corp.,
2417-25 East 23rd St., Los Angeles, 11, Calif.

DENIS, A. J., Chief Tool Engr.,
Carbide Tool Manufacturing Co.,
8689 Melrose Ave., Los Angeles, 45, Calif.

HARTWICK, HARRY T., Service Engr.,
Firth-Sterling Steel Company,
1327 Santa Fe Ave., Los Angeles, 21, Calif.

HAWLEY, JOHN S., Supt.,
California Wire Cloth Corp.,
1001 22nd Ave., Oakland, Calif.

KILLIAN, G. L., Mgr.,
Acme Wire & Steel Co.,
4068 Avalon Blvd., Los Angeles, 11, Calif.

KLOSSNER, L. W., Plant Mgr.,
General Cable Corp.,
3600 E. Olympic Blvd., Los Angeles, 23, Calif.

LUHRS, A. F., Supt.,
K. H. Davis Wire & Cable Corp.,
2417-25 East 23rd St., Los Angeles, 11, Calif.

MACK, RAY D., Pacific Dist. Mgr.,
Carboloy Company, Inc.,
5905 South Pacific Blvd.,
Huntington Park, Calif.

MORGAN, JAMES L., Industrial Engr.,
K. H. Davis Wire & Cable Corp.,
2417-25 East 23rd St., Los Angeles, 11, Calif.

PENA, PLANTON GOMEZ, Engr.,
Cia Manufacturers de Artefactos Electricos,
S. de R. L. Ave., Isabel la Catolica Num. 26,
Irapuato, Gto., Mexico

POTTER, EARL R., Supt.,
California Wire Cloth Corp.,
The Standard Wire Division,
So. San Francisco, Calif.

ROE, ERNEST, Owner,
Coast Wire Company,
527 Brannan Street, San Francisco, Calif.

SEIFERT, CHAS. G., Sec'y-Supt.,
La Consolidada, S. A.,
P. O. Box 81 Bis, Mexico, D. F.

SPEAR, EMERSON, Vice-Pres.,
Pacific Wire Rope Co.,
1840 East 15th St., Los Angeles, 21, Calif.

WILKIN, ROBERT C., Pacific Coast Mgr.,
Phelps Dodge Copper Products Corp.,
6100 Garfield Ave., Los Angeles, 22, Calif.

WOOD, James C., Supt. Wire Mill,
Columbia Steel Co.,
Pittsburg, Calif.

WRIGHT, ALBERT, Owner,
Albert Wright,
4063 Hollis St., Oakland, Calif.

✦ ✦ ✦

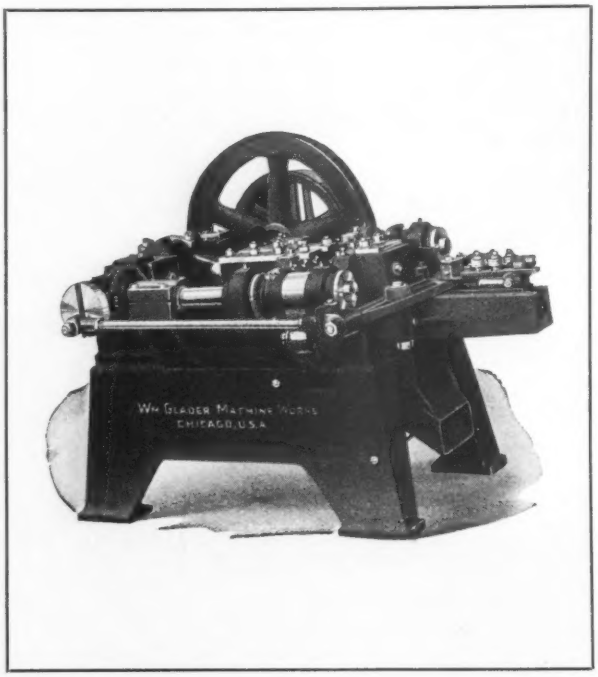
WPB Publishes "Salvage Manual for Industry"

THE first comprehensive practical manual on industrial salvage ever prepared has just been published by the Technical Service Section, Industrial Salvage Branch, Salvage Division, War Production Board, and is now being distributed to industry.

✦ ✦ ✦

THE new book, entitled "Salvage Manual for Industry," contains 245 pages of systematically organized and classified information and data — most of it of a

GLADER HIGH SPEED WIRE NAIL MACHINE



High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

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"how-to-do-it" nature — on industrial salvage practice in all its ramifications. Material is presented in 26 chapters, grouped into 6 major sections. There are 2 chapters on organizing and planning the salvage department; 3 on the administrative factors; 12 on methods of handling (finding, identifying, segregating, collecting, reclaiming, storing, selling, etc.) metal scrap; 3 on non-metallic waste; 7 case histories demonstrating exemplary practice; a 17 page compilation of practical hints for handling specific waste materials; and a 9 page index.

✦ ✦ ✦

THE well-illustrated volume was prepared and edited by an editorial board of practical industrial salvage engineers and business paper editors. Assisting the editors either with direct contributions or advice was a corps of some 40 engineering or salvage experts. No effort has been spared to cover every possible phase of practical industrial salvage operations and to present the most reliable and authoritative information about them.

✦ ✦ ✦

THE book has been described by one authority as "a combination management manual and technical guide for salvage operations." Although its major purpose is to speed Victory the "Salvage Manual for Industry" is certain also to have continued application in post-war industry because of its attention to the economic benefits of sound salvage practice.

✦ ✦ ✦

A LIMITED supply is available to readers of Wire & Wire Products, by writing Ed Mulligan, Salvage Division, War Production Board, 1100 H Street, N.W., Washington, D. C., but after the supply is exhausted, copies can only be obtained at 50c a copy from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Fidelity Issues Wire Machine Catalog

FIDELITY Machine Company, 3908 Frankford Avenue, Philadelphia, Pa., has brought out a new catalog showing their new and improved line of braiding, spooling, winding and triple-head covering machines for wire.

IN this publication will be found illustrations and descriptions of the types of machinery made for the wire industry, several of which embody entirely new developments in speed and precision spooling equipment.

✦ ✦ ✦

A COPY of this may be had for the asking by addressing Dept. W., care of the Company.

MORE PRODUCTION IN LESS TIME with CARL-MAYER FURNACES, OVENS

SERVING CONCERNS LIKE THESE:

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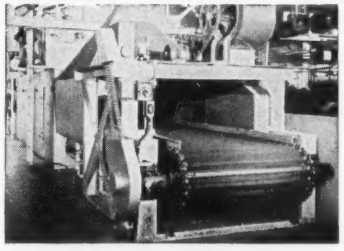
Atlas Steel Co.
Bridgeport Brass Co.
Eclipse Aviation Division of Bendix Aviation Corp.
Ford Motor Co.
General Electric Co.
General Motors Corp.
General Steel Castings Co.
Hollup Corp.
Hyatt Roller Bearing Co.
Page Steel & Wire Co.
Pittsburgh Tool Steel Wire Co.
Steel Co. of Canada
Thompson Products Co.
Timken Roller Bearing Co.
Wickwire-Spencer Co.



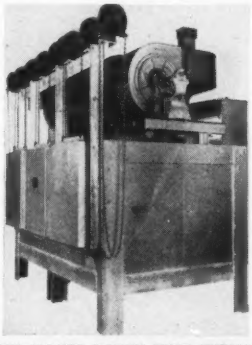
Carl-Mayer's creative ability is making furnace and oven history. Carl-Mayer equipment is not only built for super-speed and fuel economy but has the stamina to take the severe punishment of continuous production. Write for Bulletin 141.

CARL-MAYER FURNACE

One of a number built for Bridgeport Brass for stress relieving Carl-Mayer Recirculating Air Heater Furnaces are widely used because of their fast heating cycle, uniformity and amazing fuel economy.

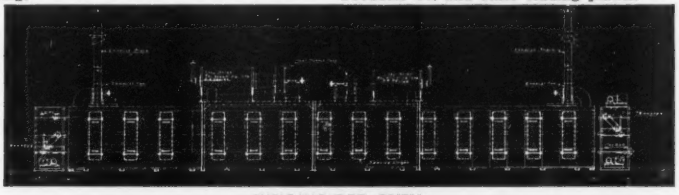
CARL-MAYER HI-SPEED ROD BAKER

The fastest rod baker built! Saves up to 50% in time and fuel. Patented Blow-Off Feature removes moisture without bumping or agitating the coils. **Patented and patents pending.**



CARL-MAYER BATCH TYPE FURNACE

Carl-Mayer Recirculating Air Heater Type Batch Furnace, Gas Fired. Numerous batch type furnaces similar to this at Aluminum Co. of America, American Magnesium Corp., Thompson Products Co. and other leading plants.



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For drying coated welding rods. Uses the "Mayer" Recirculating Gas Fired Air Heater principle and Rod Transfer Systems (patents pending).

THE CARL-MAYER CORPORATION

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A Review of Recent Wire Patents

No. 2,330,906, WIRE SPRING FOR CUSHIONED SEATS, patented October 5, 1943 by William H. Neely, Cleveland, Ohio, assignor, by mesne assignments, to The Universal Wire Spring Company, Cleveland, Ohio, a corporation of Ohio.

A triangular wire device is provided embodying a slightly upwardly-curved corrugated seating portion and slightly outwardly-curved, corrugated, converging supporting arms.

✦ ✦ ✦

No. 2,330,936, MANUFACTURE OF SLIDE FASTENER WIRE, patented October 5, 1943 by Frederick Ulrich, Bayonne, N. J., assignor to Conmar Products Corporation, Bayonne, N. J., a corporation of New Jersey.

Rolled strip metal is provided with notches, with the edge portions upset in a direction transverse to the face of the strip and containing some of the metal displaced when forming the notches, there being no residuary web or fin in the notches.

✦ ✦ ✦

No. 2,331,061, CONTINUOUS WIRE-DRAWING MACHINE, patented October 5, 1943 by Curtis Voightlander, Kansas City, Mo.

The wiredrawing unit is bodily removable from the frame while an operating worm gear and worm are in mesh.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents; outside United States and Canada, $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

No. 2,331,294, WIREWORKING MACHINE, patented October 12, 1943 by Albert M. Bank and Alexander Nicholas, Jersey City, N. J., assignors, by mesne assignments, to Super Sagless Spring Company, Jersey City, N. J., a partnership comprising Albert M. Bank and Silvia Bank.

This machine is adapted to make zig-zag wire, and includes a rotary member, a pair of parallel pins slidably mounted on the member on opposite sides of and parallel to the axis thereof, means to lead a wire between these pins, means to oscillate the member in opposite directions to form zig-zag turns in the wire, and means to alternately depress the pins of synchronism with the oscillation of the rotary member.

✦ ✦ ✦

No. 2,331,648, STRAND TWISTING APPARATUS, patented October 12, 1943 by George E. Berggren and Oscar G. Nelson, Baltimore, Md., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

In order to twist wire strands into a cable, there is provided a cradle for supporting a supply of strands, a flyer rotatable around this cradle to impart two twists to the strands as they are withdrawn from the supplies on the cradle, a capstan for pulling the strands from the supplies and over the flyer, and a post former interposed between the flyer and the capstan for applying a twist to the cable between itself and the flyer and for untwisting the cable between itself and the capstan.

✦ ✦ ✦

No. 2,331,674, COIL WINDING MACHINE, patented October 12, 1943 by Paul Xavier Fox, Horsforth, near Leeds, England.

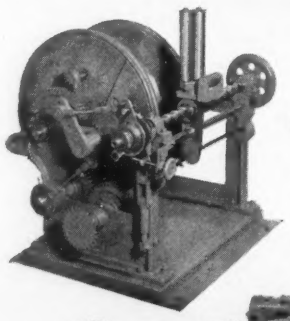
This device embodies a toroidal coil winding machine, including a ring-shaped, wire-winding core, a ring-shaped flyer with wire feed means, and a ring-shaped wire magazine.

✦ ✦ ✦

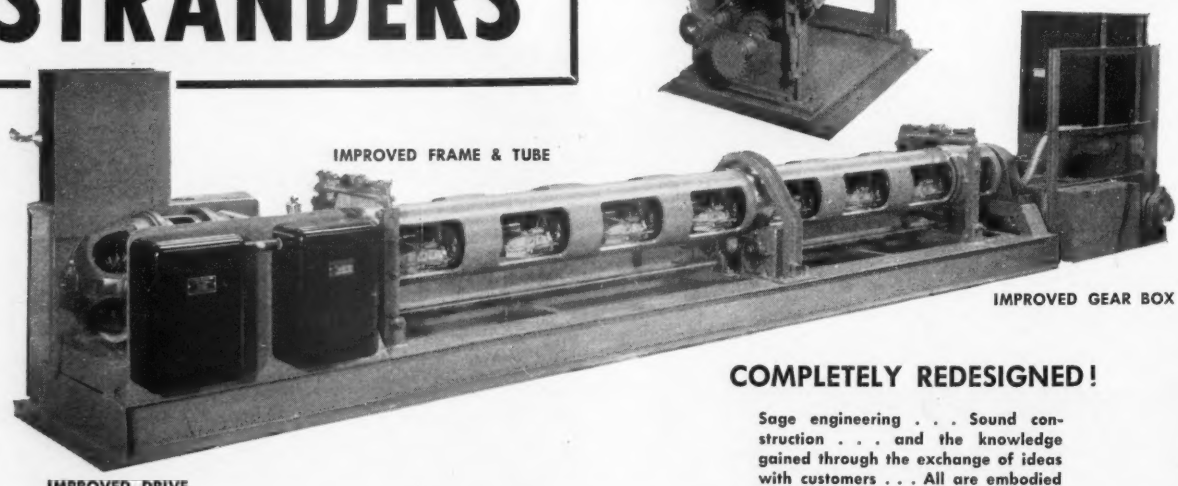
No. 2,331,719, PICK-OFF ATTACHMENT FOR AUTOMATIC SCREW MACHINES, patented October 12, 1943 by Luther A. Oeschger, Rochester, N. Y., assignor to Eastman Kodak Company, Rochester, N. Y., a corporation of New Jersey.

The pick-off attachment includes a covered chute, and means to move the chute from an operative position, wherein its entrance is disposed vertically

ROBINSON TUBE-TYPE WIRE STRANDERS



IMPROVED REEL STAND



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Sage engineering . . . Sound construction . . . and the knowledge gained through the exchange of ideas with customers . . . All are embodied in the advanced design and superior operation of the new improved Robinson Wire Strander. Full information available upon inquiry!

ROBINSON MANUFACTURING COMPANY
WORKS — MUNCY, PENNA.

Sales Representatives

MERCER-ROBINSON CO., INC., 30 CHURCH ST., NEW YORK

below and adjacent a chuck, and an inoperative position, wherein its entrance is removed from below this chuck.

✦ ✦ ✦

No. 2,331,798, WIRE DRAWING AND SPOOLING SYSTEM, patented October 12, 1943 by Carroll E. Orr, Orange, N. J., assignor to Syncro Machine Company, Rahway, N. J., a corporation of New Jersey.

A spooling machine is provided and comprises a cooperation between a capstan mounted on a drive shaft, and spooling mechanism including an independently driven shaft, means for controlling a connecting means to connect the power means to the capstan shaft during the accelerating period of the spooling shaft and for disconnecting the power means from the capstan shaft during the decelerating period of the spooling shaft, and a brake for this spooling shaft, the brake being actuated by the controlling means to aid in decelerating the spooling shaft and the capstan running free during deceleration.

✦ ✦ ✦

No. 2,331,814, SEAM FOR WOVEN WIRE FABRICS AND METHOD OF MAKING SAME, patented October 12, 1943 by William J. Taylor, Nutley, N. J., assignor to Wilson Wire Works, Inc., Kearny, N. J., a corporation of New Jersey.

Copper belts are provided with a seam in which the last weft wire in each end of the belt where the seam is to be formed being made of stainless steel, the ends of the warp wires extending beyond this stainless steel weft wires having their adjacent ends soldered together in pairs, each pair including an upper and lower warp wire with a closing wire being laced through the ends of the belt to form the seam.

✦ ✦ ✦

No. 2,332,041, SPRING STRUCTURE, patented October 19, 1943 by Vito Asaro, Detroit, Mich., assignor to L. A. Young Spring & Wire Corporation, Detroit, Mich.

This is a zig-zag wire spring assembly with most of the invention in channel-shaped supports therefor.

✦ ✦ ✦

No. 2,332,042, SPRING STRUCTURE, patented October 19, 1943 by Vito Asaro, Detroit, Mich., assignor to L. A. Young Spring & Wire Corporation, Detroit, Mich., a corporation of Michigan.

In this patent, a helical coil wire spring is disclosed, with most of the invention in the attachment of the coil to a supporting strip.

✦ ✦ ✦

No. 2,332,538, METHOD OF COATING WIRE WITH PLASTIC COMPOSITIONS, patented October 26, 1943 by Howard E. Smith, Englewood, N. J.

The method comprises preheating a conductor, heating ethyl cellulose plastic, coating the conductor with the heated ethyl cellulose plastic by leading the conductor surrounded by the ethyl cellulose plastic through a die where the length of the die is substantially three times the diameter of the die opening.

The Discussions at The Wire Association Meetings Will Be Published in Detail in the January, 1944 Issue of Wire and Wire Products.

No. 2,332,609, APPARATUS FOR MANUFACTURING WIRE DRAWING DIES, patented October 26, 1943 by Morris Simons, Ridgefield, Conn.

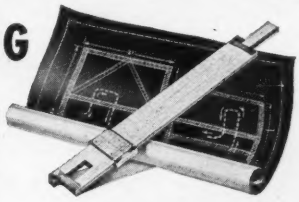
Adjustments are provided which predetermine the contour given the diamond needle drill point by the associated grinding wheel when the latter is engaged with the drill point.

✦ ✦ ✦

No. 2,332,709, MEANS FOR ATTACHING WOOD HEELS TO SHOES. patented October 26, 1943 by William Clark Goodchild, Jr., Beverly, Mass., assignor to United Shoe Machinery Corporation, Flemington, N. J., a corporation of New Jersey.

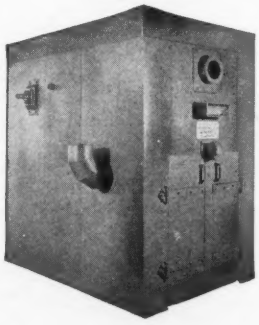
The means comprises a driven, headed metallic fastener, having a collar below the head of the fastener this collar being loose and may tilt laterally with relation to the fastener when the latter is driven into the heel.

OVEN ENGINEERING NEWS



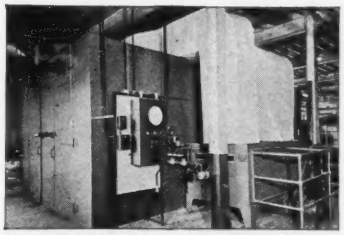
Standard Box Ovens Provide High Speed, Top Efficiency For Simpler Heating Jobs

For simpler heating applications not requiring elaborate handling, conveying or heating equipment, box-type ovens such as these can often be used to advantage. The Industrial Oven



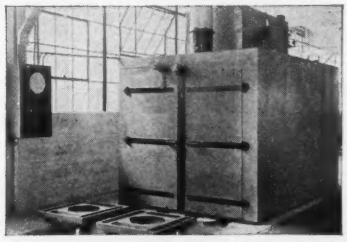
Engineering Company designs and manufactures a complete line of such ovens.

This 900° oven for heat treating aluminum forgings has a built-in, high-pressure air heater for positive and rapid circulation through a relatively dense work load. The oven is shipped assembled, requiring no post-delivery assembly except attachment of accessories.



Above: Designed for baking synthetic finishes on storage cabinets and now used to finish ordnance items, this oven cut baking times 15%.

Below: Standard type dehydrogenizing oven for various widths and gages of cold rolled steel strip; this unit cut heating time 50 percent.



Supply Limited!

Get your copy of "Blueprint for Industry—Part II" right now, because we are running short of this interesting 18-page engineering book. It contains detailed information and blueprints on a variety of high-production convection heated ovens for industry, as well as other useful engineering data.

(Feel free to ask for additional information on any fact presented on this page.)

THE INDUSTRIAL *Oven Engineering* COMPANY

11621 Detroit Avenue **Cleveland, Ohio**

Some Practical Facts About the By-Products Formed in Different Fields of Hot-Dip Galvanizing

(*Continued from Page 774*)

aluminum. Silver Metal, tin, and other commercial alloys have a direct affect on oxide skimming production. The kind of articles, the operations, draining time, skimming operations over the bath, bath temperature, quality of zinc, and many other factors have a direct bearing on oxide production.

✦ ✦ ✦

Sal-Ammoniac Skimmings General Statement

NO doubt it has been noticed already how the different fields of galvanizing have shifted their places according to the by-product discussed. In the sal-ammoniac skimmings graph shown in Figure 3 we find that range boilers and tank galvanizing has done an about face and gone to the lower end of the graph. Pole-line hardware has gone into first place with a production average for the industry of 21.4% of this by-product. We also note that wire which was at the bottom in the oxide skimming graph has shifted up to the top into second place on the skimmings graph. The places are listed in Table III.

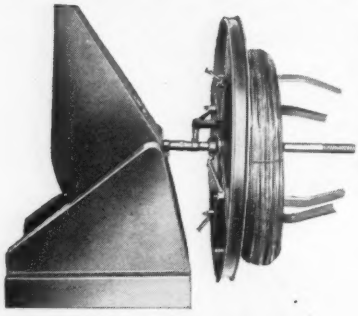
TABLE 3

Average Percentage of Sal-Ammoniac Skimmings Made in the Different Fields of Hot-Dip Galvanizing	
1. Pole-Line Hardware	21.4%
2. Wire	18.1%
3. Wire Cloth	12.6%
4. Job and Miscellaneous	11.1%
5. Malleable Iron Castings	10.2%
6. Structural	9.7%
7. Pipe	9.0%
8. Sheets	9.0%
9. Metal Ware	5.8%
10. Range Boiler and Tanks	1.0%

HERE again individual plants may find their figures somewhat different from those given in this table. In some plants it has already been mentioned that the two by-products have been found to be put together when there is a small amount of one or the other. They are called by the one name "skimmings."

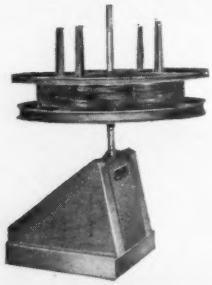
✦ ✦ ✦

WE will not attempt to go into too much detail in discussing this by-product in the different fields of hot-dip galvanizing. It calls to attention that those fields of galvanizing making a large percentage of sal-ammoniac flux skimmings have the bath entirely covered with this slag flux during galvanizing operations. Another important factor that should be noted is the tonnage production factor. More flux must be used for material galvanized. The sheet



Above—"Shiftweight" Loading Position

Below—"Shiftweight" Feeding Position



A Husky Helper . . . Always "On Its Feet"

• The Moslo "Shiftweight" wire reel eliminates the need for an extra man in handling coils of wire. It is counterbalanced with an automatically shifting weight that holds it steady in either loading or feeding position. Easy to load without lifting . . . Swings easily to feeding position . . . Feeds smoothly and kink-free. A back saver, time saver and money saver.

Write for booklet describing this and other types of wire reels. Upright or horizontal drum reels . . . Upright cone reels, all built to give service, speed production.

Moslo Makes Everything for the Welding Electrode Processing Plant

MOSLO MACHINERY COMPANY

2439 PROSPECT AVENUE • CLEVELAND, OHIO

galvanizing field has a very much smaller part of the bath covered with flux and that is one reason why it is so far down on the graph. Wire and Pole-Line hardware, and Job and Miscellaneous Fields are not only heavy production fields, but also the bath surface is very large that has to be covered with flux. Malleable castings baths are both large and medium size pots so that there is a fairly large amount of sal-ammoniac flux made in this field of galvanizing. Also some of the fields of galvanizing still use the old muriatic acid dip method of fluxing, and this type of operation uses less sal-ammoniac salt, and hence there is a lower quantity of sal-ammoniac flux made as a by-product.

✦ ✦ ✦

Summary

THE amount of sal-ammoniac flux made is highest in those fields of galvanizing having a large bath surface area, a bath entirely covered with sal-ammoniac flux, and a heavy production through the bath. Those fields having a small sal-ammoniac flux area, or half the bath uncovered, are on the low end of the graph.

✦ ✦ ✦

Carboloy Extends Wire Drawing Cored Dies to Smaller Sizes

TO assist mills producing fine wire, etc., Carboloy Company, Inc., Detroit, has announced the availability of round hole cored dies in stock sizes as small as 0.004 to 0.007 inches. Since the war, a tremendous impetus given to the drawing of fine steel wire for cables, balloon barrage, etc., has made such a development desirable. Heretofore, however, it was practical to produce such dies mainly in rough drilled form at substantially higher costs than cored dies. Previously, the smallest cored die available was a 0.015 inch hole size for finishing to 0.020 inches. For smaller sizes it was necessary to purchase more costly rough drilled dies or blank dies for piercing by the mill.

THUS the new smaller cored die sizes mean a further increase in economy through the use of Carboloy cemented carbide dies, now standard in most of the Nation's wire mills. It eliminates the necessity for either an initially higher die investment or of piercing blank dies by the mill to produce diameters of wire down to 0.010 inches, saving valuable machine and man hours in the die room either at the mill or in the shop of the supplier. The new dies are available with standard size R-2 Carboloy nibs and casing sizes either 1 inch or 1-½ inch by 9/16 inches.

✦ ✦ ✦

Production Award

FOR continued excellence in the production of heat treating furnaces and equipment, the Lindberg Engineering Company of Chicago has been awarded a star for their Army-Navy "E" burgee.

If your problem is corrosion, the solution will be HERE!

The HAVEG bulletin illustrated contains complete physical, chemical resistance, and design data to enable an engineer to design for HAVEG equipment without voluminous correspondence.

Write at once for your copy.

HAVEG-SARAN *Tubing; Pipe & Fittings; and sheets are available from stock.* **HAVEG-SARAN** *is also described in Bulletin F-3. Send for a copy now.*

HF-43

HAVEG CORPORATION
NEWARK, DELAWARE
FACTORY–MARSHALLTON, DELAWARE

CLEVELAND 550 Leader Building | CHICAGO 1201 Palmolive Building | DETROIT 2832 E. Grand Blvd. | LOS ANGELES 601 W. Fifth St.

An "All Metal" Expansion Chart

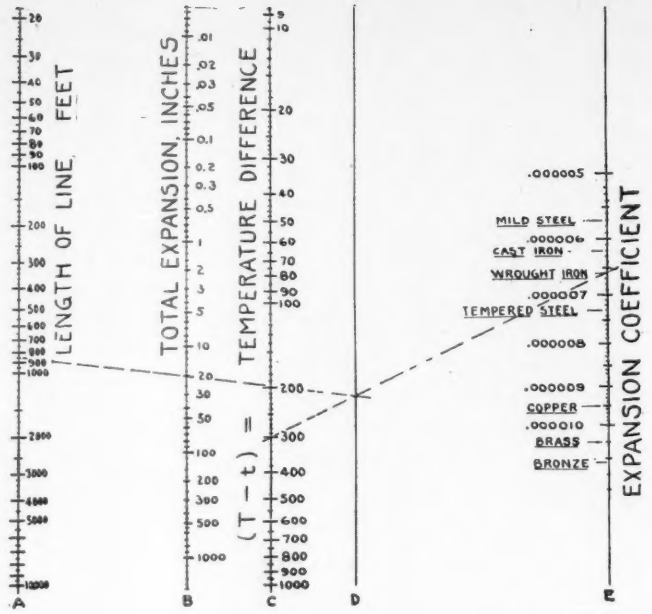
THIS chart will be found useful for quickly determining the expansion of any ordinary metals —from mild steel to bronze — or any material having an expansion coefficient between the limits 0.000005 and 0.000012. The chart handles any length of any of these metals or materials, from 20 ft. to 10,000 ft.

+ + +

FOR example, how much will 850 ft. of wrought iron pipe expand when the temperature increase is 300 deg. F.?

+ + +

CONNECT the 300, column C, with the coefficient of expansion of wrought iron, column E, and locate the intersection with column D. Then from that point of intersection run over to the 850 in column A and the expansion is found to be 20 inches in column B.



SO, all one has to do is to lay a straightedge across the chart twice and the total expansion in inches is found without bothering one whit with the decimal point or with longhand figuring. If you haven't a straightedge use a thread, a straight piece of paper,

Patented

2 BX Mossberg Carrier

MOSSPEED BRAIDER CARRIERS

Represent

Improved Braiding at Lower Costs

The patented MOSSPEED spring tension take-up makes it possible to increase the speed of the maypole-type braiding machine. An effective increase of 80% being obtained in many cases.

The new (x) type MOSSPEED high speed carrier permits the rapid changing of tension springs making this an ideal carrier for braiding all kinds of yarn (cotton, rayon, asbestos, jute), in addition to fine strands of copper wire.

Consult our engineers regarding your braiding problems.

2 SE Copholder

Complete line of both MOSSPEED carriers and metal copholders for all sizes and makes of maypole type braiding machines.

MOSSBERG Pressed Steel Corp.

18 West Street

Attleboro, Massachusetts, U. S. A.

Ross Whitehead & Co., Ltd., Montreal and Toronto, Canada.

James Day (Machinery), Ltd., "Ford House," 88 Regent Street, London, W. I., England.

or anything else that is convenient and that happens to be straight.

✦ ✦ ✦

THE temperature difference, column C, is found by subtracting the minimum temperature from the maximum. Thus a steam pipe at its coldest may be 40 deg. F. At its hottest it may be 740 deg. F. The difference is therefore 740 - 40 or 700 deg. F.

✦ ✦ ✦

New Catalog On Copper and Copper Alloys

THE Eastern Brass & Copper Company, 515 Greenwich St., New York, N. Y., has just issued a cloth bound catalog and handbook containing over one hundred pages of all the ready information required by war contractors using these products. The book gives a list of the copper, brass and alloy shapes and forms available, and embraces a copper and copper alloy digest, the latest weights and measures charts, tolerance requirements, government specifications and miscellaneous data. It is available to war contractors on application.

✦ ✦ ✦

Commercial Production of New Plasticizers and Softeners

A SERIES of new plasticizers and softeners for use in coatings, adhesives, plastics, cellulose esters and ethers, synthetic resins and synthetic rubbers, are now being produced commercially. They consist of alkyl and alkyl ether esters of higher fatty acids and dicarboxyllic acids. They are characterized by their low freezing points and very mild odors. A chart listing these new products giving the following physical properties is now available: Specific gravity, color, solidification point, acid value, solubility, boiling point, compatibility and odor.

✦ ✦ ✦

COPIES of this chart can be obtained from the manufacturers of these plasticizers, the GLYCO PRODUCTS CO., INC., 26 Court Street, Brooklyn, New York.

Gilron

DRAW YOUR WIRE THE MODERN WAY with

GILRON COATING COMPOUNDS

A big step forward in wire drawing. Thoroughly proven in mill practice. Makes possible wire drawing speeds heretofore considered impracticable. Increases die life, prevents scratching of wire, produces better finish and eliminates use of lime in many cases.

These coating compounds are of particular value in the more difficult operations—stainless, alloy, high carbon and welding rod wire. Multiple reductions can be drawn without re-coating.

Coatings for Drawing Stainless, Alloy, Low and High Carbon and Copper Coated Wires

Let us confer with you. Write or telephone for particulars.

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"STANDARD" MACHINERY

Look in the new Sweets Mechanical File for our Latest Catalog.

FOR EVERY METAL PROCESSING NEED

Hydro-Former
Shapes and joins metals without cutting.

Swaging Machines
Eight sizes for hot and cold pointing.

Draw Benches and Wire Drawing Machines
Reversing and continuous chain types for drawing up to 50,000 lbs.

Power Presses
Low cost, precision blanking and embossing machines of all sizes.

Turks Heads
Wire drawing to special shapes through friction and power driven rolls.

Rolling Mills
Special Two and Four-High Mills for breakdown and precision rolling.

Fluid Drives
Variable Speed, Controlled torque, — for every power transmission requirement.

LOOK IN SWEET'S FILE OR WRITE FOR OUR NEW CATALOG NO. 143

STANDARD MACHINERY CO.
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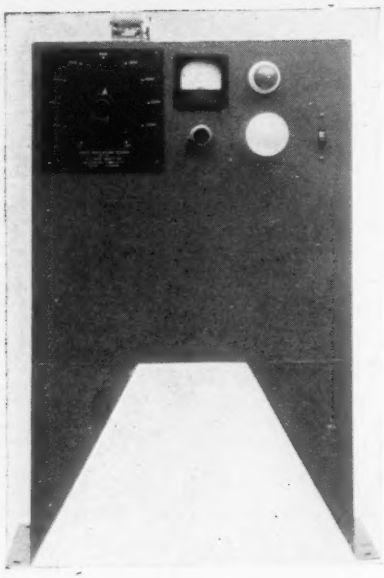
SPARKER for SYNTHETIC EXTRUSION COMPOUNDS



THIS APPARATUS WILL LOCATE DIELECTRIC FAULTS while the wire is being insulated. When breakdown occurs, the operator is notified by an audible alarm. A resettable counter gives the number of faults in each reel. By sorting out the defective reels in this operation, the majority of the resparking is eliminated. Continuous range of voltage at the electrode is from one thousand to sixteen thousand volts. The sparker is equipped with voltmeter reading in kilovolts, and automatic interlock with the takeup motor.

R. L. Davis Electric Co.

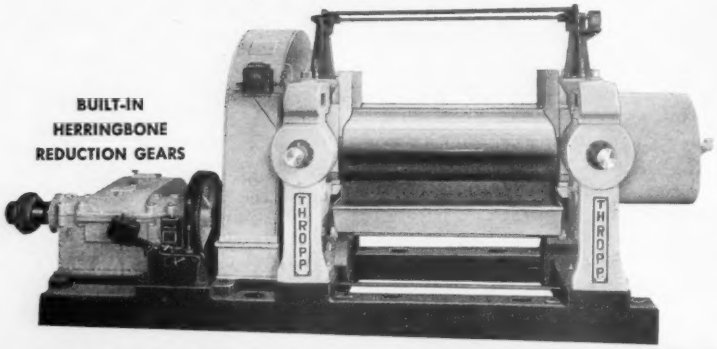
Wallingford, Conn.

New! HEAVY DUTY MILLS
Size 20 & 22 x 60 Inch

for·· Compounding and Warming of Synthetic Rubber and Tough Resins. Custom built to your requirements.

Write for Complete Information

BUILT-IN HERRINGBONE REDUCTION GEARS



WM. R. THROPP & SONS CO. TRENTON *New Jersey*

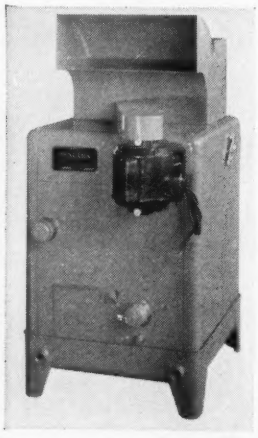
WASHERS CRACKERS REFINERS CALENDERS

Compressed Air and Gas Cooling Equipment

IMPROVED equipment for the cooling of compressed air results in drier air and prevents water damage to pneumatic equipment; for example: rapid wearing out of parts because of washing out of lubricants — freezing up of pneumatic tools halting production — damage to work by water in paint spray, rusting of metallic shot in blast cleaning equipment.

✦ ✦ ✦

THE new NIAGARA Aero AFTER COOLER for compressed air uses the evaporative cooling principle to obtain the lower temperatures and a new design gives greatly increased capacity in compact apparatus. Air, drawn by a fan thru a water spray across coils containing the compressed air is the cooling medium and temperatures within 10° of the wet bulb air temperature can be maintained. This permits lower temperatures by 10° to 25°, than conventional coolers and produces



compressed air that contains only one-half to three-fourths the amount of water formerly experienced with the best practice. The equipment is also applied to gases generated for industrial use. The manufacturer is the NIAGARA BLOWER CO., 6 E. 45th St., New York-17, N. Y.

Instruction Manual On Gages

FEDERAL Products Corporation, 1144 Eddy St., Providence, R. I., recently completed an instruction booklet covering the setting and using of Federal Model 1201 Series of dial indicator hole gages.

✦ ✦ ✦

THE manual is only of interest to those who use this particular gage in their shops. It goes into such details as how to handle, set and read the gage and is valuable as this series is one of high sensitivity and accuracy.

✦ ✦ ✦

USERS of the gage may secure a copy upon application to the Corporation.

✦ ✦ ✦

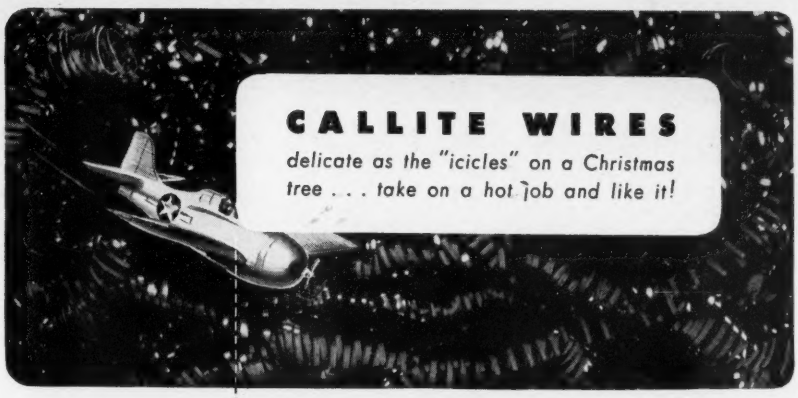
Heavy Model of Metal Forming Machine Offered

THE O'Neil-Irwin Manufacturing Co., Minneapolis, 15, Minn., is placing on the market a new heavy and rugged unit called the DI-ACRO Bender No. 3. This machine has been newly engineered for heavier jobs, especially in aircraft and marine work, in response to a demand for a bender that would handle heavier metals and form greater diameters than the regular models. A seven inch circle and two right angles can be formed in one operation with this new bender. The illustration shows an operator

forming a pipe support with the machine.

✦ ✦ ✦

A CIRCULAR describing the No. 3 model will be mailed to interested parties upon request.



Callite Stainless Steel Wire, processed by the Montgomery Co., manufacturers of wire and tinsel products in Windsor Locks, Conn.

CALLITE Stainless Steel Wire resists hot engine gas as a unique instrument continuously analyzes a sample of the exhaust from powerful aircraft engines. Quality wires aid precision flight by keeping the pilot informed of fuel condition. The Montgomery Company converted this Callite Stainless Steel Wire into spirals for filters for the Cambridge Instrument Company.

Fine wires must be dependable, drawn to the optimum strength of the alloy, accurate in size and temper. CALLITE TUNGSTEN CORPORATION, 572 Thirty-ninth Street, Union City, N. J. Branch Offices: Chicago, Cleveland.

CALLITE
FINE WIRE

For springs, instrument parts, scratch brushes, control cables, bonding jumpers and sieves; in 9 major metals and their alloys; precision diameters down to .002 or smaller; drawn to your specifications.

FIDELITY
SINFRA
MULTIPLE-HEAD
HIGH-SPEED
COVERING
MACHINES

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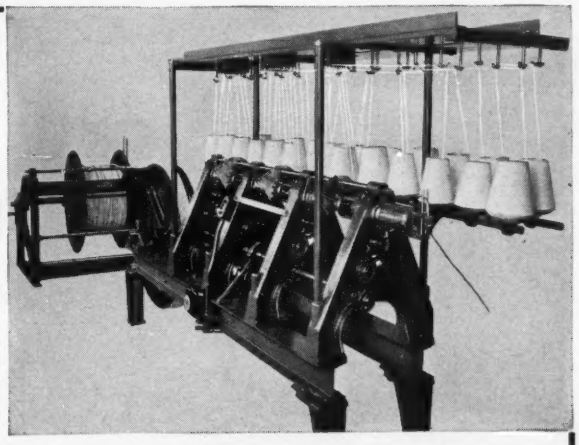
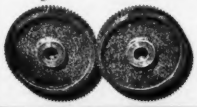


Knits two or three cotton coverings on bare wire up to #6 gauge—also flat or shaped, continuous-strip material, 1200 to 1500 feet per hour. Saves rubber since cotton coverings, impregnated, form excellent insulation. Straightening rollers operate horizontally and vertically. Each head knits one cover. 20″ or 36″ capstan take-off—separate haul-off reel stand, 40″ O.D., with traverse mechanism, 1000 lb. capacity.

Other advantages include: automatic electric stop motion on each yarn; improved knitting head and needle design; knits direct from large cones; quiet operation reduces operator fatigue.

Available in double- and triple-head types. Write for Bulletin.

Designers and Builders of Intricate, Automatic Precision Machines



32 YEARS' EXPERIENCE
FIDELITY MACHINE COMPANY
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PRECISION CENTERED EYE BENDING

With

DI-ACRO BENDERS

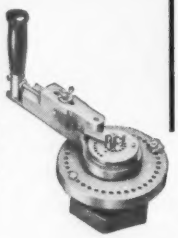
DI-ACRO precision bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

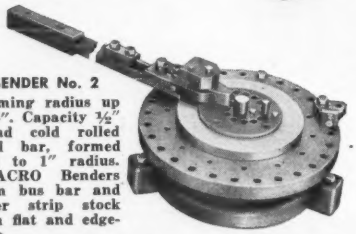
A Centered EYE in 1 Operation

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at the rate of up to 1000 an hour. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

BENDER No. 1

Forming radius up to 2". Capacity 7/32" round cold rolled steel bar or equivalent. All DI-ACRO Benders have two-way action, right or left hand mounting and reversible forming nose.





BENDER No. 2

Forming radius up to 6". Capacity ½" round cold rolled steel bar, formed cold to 1" radius. DI-ACRO Benders form bus bar and other strip stock both flat and edgewise.

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING O'NEIL-IRWIN MFG. CO.

314 8th Ave. S. Minneapolis 15, Minnesota

WILLEY'S DIES LAST MUCH LONGER

WILLEY'S TIPPED SHELL REAMERS

Let Willey's engineers design and build special cutting tools to fit your individual needs and machining operations. Tools "Tipped by Willey's" offer you definite price and production advantages. Good delivery. Send us your prints for quotation and delivery date.

And Remember
WILLEY'S DIES

WRITE TODAY
For
WILLEY'S CATALOG

Contains full information about WILLEY'S METAL, standard cutting tools, special tools and gages, extrusion and wire drawing dies, centerless grinder blades and tungsten carbide grinders.

WILLEY'S CARBIDE TOOL CO.
1340 W. Vernor Highway, Detroit, Michigan

Oakite Publication Contains Interesting Article on Wire

"WIRE MANUFACTURE" is the title of the illustrated, informative feature article appearing in the current issue of OAKITE NEWS SERVICE, the bi-monthly house magazine of Oakite Products, Inc., New York. This key items brings to the front the interesting historical highlights of wire products and reveals their multifarious uses.

✦ ✦ ✦

FOUR pages are devoted to outlining the various manufacturing processes or operations necessary to produce high grade wire, describing specially designed materials and methods for inhibiting attack of acid on steel, sull coating and liming, through whose uses are secured four important wartime advantages: (1) Making possible more tonnage from the same equipment; (2) Reducing rejects; (3) Prolonging die life; and (4) Improving wire appearance.

✦ ✦ ✦

A SECOND article treats of paper-making and describes the important place of Fourdrinier wire in this industry. Copies of this September-October issue of OAKITE NEWS SERVICE are available by writing to Oakite Products, Inc., 52A Thames Street, New York 6, N. Y.

✦ ✦ ✦

Driver-Harris Gets "E" Star Award

THE Driver-Harris Company announces that the War Department has conferred the Army-Navy E "Star" Award upon the women and men of its organization. The white Star which is added to the Army-Navy Production Award flag is a symbol of appreciation from our Armed Forces for Driver-Harris Company's continued and determined effort and patriotism.

✦ ✦ ✦

DRIVER-Harris Company manufactures special alloys that are used in every branch of the Armed Services.

Western Electric Makes Large Use of Sub-Contracts

WESTERN ELECTRIC COMPANY, in a report to the War Production Board and the Smaller War Plants Corporation, recently disclosed that 50 per cent of the Company's total sales of war materials to the Government since the U. S. entry into the war had been produced by subcontractors. In meeting its commitments to the Government, Western Electric Company currently does business with more than 6,500 subcontractors and suppliers.

+ + +

THE Company's subcontracting rate of 50 per cent exceeds by 10 per cent the rate which the War Production Board requested prime contractors to establish in an effort to step up the output of munitions and provide business for smaller manufacturers whose pre-war production has been shut off through the diversion of strategic materials into war production.

+ + +

New Catalog On Industrial Trucks

TO acquaint industry with their war-standardized line of electric industrial trucks, The Yale and Towne Manufacturing Company, Philadelphia Division, recently published a 76-page catalog. The booklet contains detailed descriptions of all models, as well as a great many application illustrations, showing many uses of industrial power trucks.

+ + +

A SEPARATE section is devoted to the workings of the War Production Board's Limitation Order No. L 112, as applied to Yale Industrial Trucks.

+ + +

COPIES of this catalog are available on request direct to the Company.

APEX "PIC-KLEEN" PERFORMANCE DATA

(Case #23)

Type of Wire: **Stainless Steel NE-8620**

Speed: **350 ft. /min.**

Reduction: **5/16" rod to .202 finished size**

No. of Holes: **2**

Drawn: **Dry**

Tensile: **168-192,000**

Results: **The use of APEX "PIC-KLEEN" in this case eliminated a heretofore necessary 45-minute sull-coating operation, as well as doing away with a 15-minute pickling cycle.**

Conclusion: **A fine finish was obtained, and valuable time saved. Handling costs were materially reduced. APEX "PIC-KLEEN" COATING COMPOUND can do for *you* in *your* Mill, just what it has already done in many other Wire Mills, and on most types of wire. A trial will convince you.**

APEX ALKALI PRODUCTS COMPANY

MAIN and RECTOR STREETS

PHILADELPHIA 27 **PENNSYLVANIA**

Announcing A Special Issue for January, 1944

— SPECIAL BECAUSE —

The discussions on technical papers at the annual meeting of the WIRE ASSOCIATION will be published in their entirety

and

— THE MORDICA MEMORIAL LECTURE FOR 1943 —

By Flint C. Elder, Special Research Engineer, American Steel & Wire Company, Cleveland, Ohio,

on the subject

"THE WIRE DRAWING DIE"

will also be published in this issue.

— TO OUR ADVERTISERS —

The advertising value of this special arrangement to be followed in the January issue of WIRE and WIRE PRODUCTS is obvious.

Revised rate card will apply to this issue - Closing date, December 20th, 1943.

RESERVE YOUR SPACE AT ONCE

WIRE & WIRE PRODUCTS

PHONE STAMFORD 3-0482

300 MAIN STREET STAMFORD, CONN.

WANTED

General Manager with Metals and Wire Products Sales Management Experience

• Excellent opportunity for a mature, broadvisioned sales executive with a metallurgical background and an outstanding sales management experience with fine wire and wire products.

• He must know the sales problems of this field intimately and be well acquainted with present and prospective purchasers of such products. He should be able to contribute constructive ideas on expanded sales to postwar markets.

• This man will head one of our important sales divisions. Permanent position having definite postwar possibilities with organization of world-wide reputation in electrical research and development. Must be American citizen, preferably 35 to 42 years of age.

• In replying, state age, education, draft status, full details of experience, salary requirements. Enclose photograph. Address O. M. E. Loupart, Executive Vice President, North American Philips Company, Inc., Dobbs Ferry, Westchester County, N. Y.

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Book On Internal Grinding

THE Norton Company, Worcester, Mass., has published a new 64-page handbook on internal grinding intended primarily for operators of machines performing these operations.

✦ ✦ ✦

IT contains a chapter on grinding machines, another on the selection of the proper grinding wheels for different jobs, and a third on grinding troubles and their correction. This last chapter includes tables of grinding wheel speeds and other data.

✦ ✦ ✦

COPIES are available on request. Ask for "The A B C on Internal Grinding".

✦ ✦ ✦

ANOTHER interesting booklet covers the use of Norbide (boron carbide) for various types of gages, gage blocks, inserts, micrometers, and indicator points. This will also be sent on request.

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THIS easy-to-make dispenser suggested by **John Antkowick,** a workman at General Electric's Schenectady Works, simplifies the feeding of ribbon-type solder in silver-alloy brazing work and prevents waste. The dispenser is a flat metal case containing two rollers, one in the circular portion and another near the point. The silver solder is thumb-fed over the second roller and out the point of the dispenser through a slot in the edge of the case. Previously, the operator would cut a piece of solder about two feet long. As this strip became shorter it would get too hot to handle and the workman would drop it and get another piece. The dispenser can be loaded quickly with sufficient solder for a large number of brazes, and permits the operator to keep his hand far enough from the work to avoid being burned.

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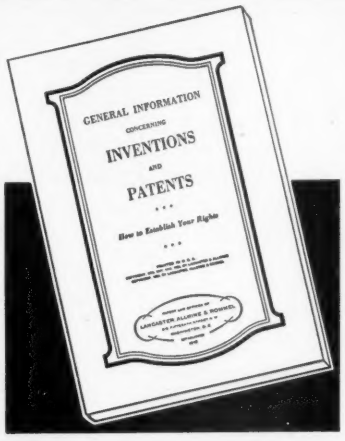

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New Electronic Wire Recorder

TROOPS, officers and war correspondents in North Africa are hearing news programs and the "Army Hour" broadcasts produced in this country for the first time via a new type of electronic wire sound recorder and playback unit built by General Electric Company.

✦ ✦ ✦

ACCORDING to **Colonel E. M. Kirby**, chief of the Radio Branch of the Army's Bureau of Public Relations, "Two General Electric engineers, **E. A. Malling** and **A. W. Sear**, of Bridgeport, Conn., pick up two news roundups and the 'Army Hour' broadcast each week on a regular radio receiver, and record the programs on the new electronic unit. The wire, on spools, is then air mailed from Bridgeport to Washington where it is put on a transport plane and flown directly to Algiers, Africa.

✦ ✦ ✦

SIXTY-SIX minutes of continuous speech and sound can be recorded on 11,500 feet of hair-like steel wire on a spool no larger than the ordinary doughnut in the new recorder. A combination unit, weighing less than 50 pounds, has built-in recording, playback, and instantaneous erasure features. A field set with the recording unit weighs only about nine pounds and can be carried on the back, operated by batteries.

✦ ✦ ✦

THE army hopes that the new lightweight wire recorder will bring a new dimension and flexibility to radio's coverage, according to Colonel Kirby. Experiments in planes 30,000 feet above ground and in jeeps, using power from the electrical systems of the vehicles, prove the value of wire recording, he said.

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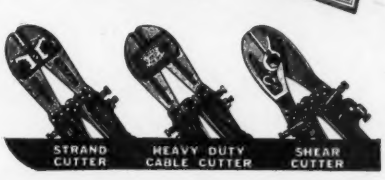

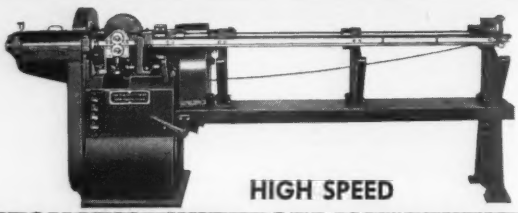

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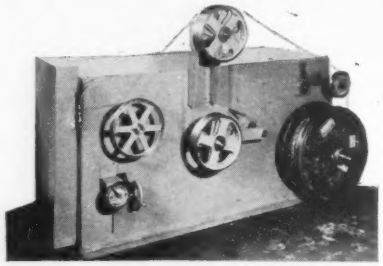

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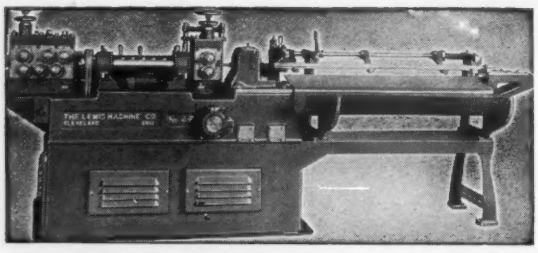

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Electronic Instrument Checks, Evaluates and Sorts Metals and Alloys

USING the Du Mont Cyclograph, today's average war worker can check or evaluate or sort production pieces, samples or material stock of varying metallurgical characteristics, both rapidly and dependably. Ordinarily, this routine would require the services of skilled metallurgists surrounded by well-equipped laboratories. Conventional methods are "destructive". That is to say, such methods include sawing the samples apart and etching exposed cross-sections to reveal vital structural details under the microscope, drilling or filing samples for chemical check-up, etc. The indicating portion of this machine, the oscillograph, provides the desired information at a glance, without damaging the samples. Thus the Cyclograph acts to speed production.

✦ ✦ ✦

METAL or alloy products of a given type can look much alike. Although such differences as size, shape, color, shade, surface, finish, may be readily discernible, there can be unseen and vital metallurgical differences from one piece to the next. In the case of armor-piercing shot, for instance, proper hardening may determine ability to pierce armor. Several lots of airplane bolts of different metallurgical compositions may be inadvertently dumped together in the best regulated stockrooms. One lot of bolts may have high hardness but with corresponding brittleness. Another lot may be relatively soft and free from brittleness. Which lot is which? This point must be settled before those bolts go into actual assemblies. Or, it may be a case of testing rollers for roller bearings. Have these rollers or roller bearings been sufficiently heat-treated to withstand the wear and tear of airplane engine service?

✦ ✦ ✦

THE Du Mont Cyclograph is an electronic instrument designed

around cathode-ray tube indicators. Cathode-ray tubes are funnel-shaped glass tubes with intricate innards that translate electronic findings into glowing patterns on their flared-end screen. These patterns are usually called oscillograms. In the case of the Cyclograph, the pattern is known as the "cyclogram". The Cyclograph has been developed to provide a means of determining differences or variations in metallurgical properties of metal parts or stock. Some of these properties which have been successfully investigated include measurement of case depth, core hardness, plating thickness, carbon content, brittleness and variations in heat treatment. Such measurements require that all properties except the one under observation remain reasonably constant from sample to sample.

✦ ✦ ✦

THE Cyclograph utilizes the principle that the metallurgical properties of metal causes variations in the core loss of a tuned pickup coil surrounding the piece under test. These variations affect the shape of an easily interpreted pattern of cyclogram on the cathode-ray screen. By such means a semi-skilled operator can easily determine differences in metallurgical properties of a number of ostensibly similar parts, or can conduct incoming inspection tests on bar or other forms of stock.

✦ ✦ ✦

SINCE the Cyclograph is primarily a technical service, with the instrument fitted to the given application and subject to changes from time to time in step with changing conditions, the device is necessarily installed only on a lease basis.

✦ ✦ ✦

FULL information regarding the device may be secured by writing Dept. W, Allen B. Du Mont Laboratories, Inc., 2 Main Ave., Passaic, N. J.

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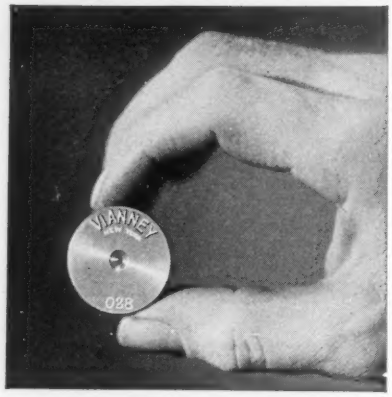

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American Standards Association Revises Code for Abrasive Wheels

THE American Standards Association have announced approval of an important revision of the Abrasive Wheel Safety Code, which is so widely used that it has been called the Bible of the Grinding Industry. This is the first revision of this Code since 1935.

✦ ✦ ✦

NEW sections have been added to keep pace with changes in the industry. Completely new rules have been written for mounted wheels. New speed rules have been drawn up for crankshaft grinding, camshaft grinding and thread grinding operations. While the basic speed tables remain the same, the Code has been carefully reviewed and many points have been clarified.

✦ ✦ ✦

NEED for a revision of the Code became increasingly apparent during the period of expanding war industries. Several types of abrasive wheels and grinding operations which previously had very limited usage, found an important place in the new industries.

✦ ✦ ✦

THE appendix of this standard is of particular interest. It contains a great deal of information on subjects related to safety in grinding and should serve to give a further understanding of the rules in the Code. For instance, the difference in strength prop-

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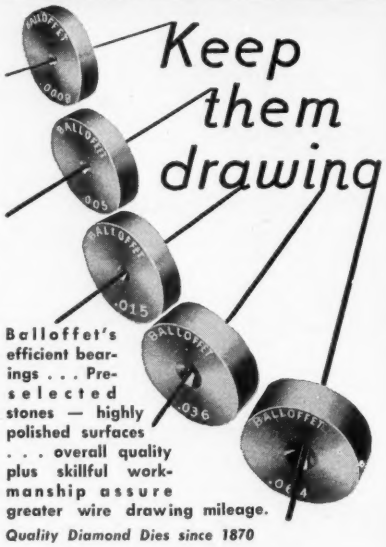

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erties of various types of wheels is discussed in considerable detail. Another section of the appendix explains the meaning of "critical speed" as related to the operation of mounted points and wheels.

✦ ✦ ✦

CONSIDERABLE research and engineering work preceded the formulation of some of the new rules and specifications. The operating rules and critical speed tables for mounted wheels and points were prepared only after a comprehensive study of the whole subject requiring well over a year, and including a great deal of actual testing under controlled conditions. Before approving the lighter weight drawn steel guards for portable grinders, samples were tested by breaking wheels in them and observing the results.

✦ ✦ ✦

THE Grinding Wheel Manufacturers' Association, and particularly its Safety Committee, took the leading part in the revision of this Code. Because of the extent of the revisions, a special Steering Committee was appointed to guide the progress and direction of the work. This committee was composed of: **Mr. John W. Welch**, Chairman; **Mr. A. Rousseau**, Assistant Manager of the Norton Co., Secretary; **Mr. George E. Sanford**, Safety Engineer of General Electric Co., and **Mr. J. B. Chalmers**, Director of Training at the Yale & Towne Mfg. Co.

✦ ✦ ✦

THE Safety Code for the Use, Care, and Protection of Abrasive Wheels (B7-1943) may be obtained from the American Standards Association, 29 West 39th Street, New York 18, N. Y., at 35c per copy.

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Booklet On Material Handling

THE Clark Trucktractor Division of the Clark Equipment Company, Battle Creek, Michigan, has just published a 32-page booklet written by **Ezra W. Clark,** Vice President and General Manager of the Company, in which he describes the uses of industrial trucks and tractors in American industry. This booklet, entitled: "Mobile Materials — Handling Equipment" may be secured by writing the Company for it. It is not a catalog, but a treatise on the general subject of handling materials, and contains references to many specific problems in different industries, including the use of such equipment by the Army, now our largest single user of this type of equipment.

✦ ✦ ✦

Farrel-Birmingham Awarded Third Renewal of Navy "E"

AMONG the first to receive the Navy "E" early in 1942, Farrel-Birmingham Company, Inc., manufacturers of marine gear drives for Navy and Maritime Commission vessels as well as heavy machinery for the steel, metal working, rubber, plastics, paper and sugar industries, has received its third renewal for continued excellence in the production of equipment for the Navy.

✦ ✦ ✦

"Color-Branding" — Sintered Carbide

THE broad use of Sintered Carbides for cutting tools has resulted in the making of a variety of grades. Since these tips all look alike the user needs a quick, visual method of identifying the correct grade for each purpose. The Firth-Sterling Steel Company has adopted "Color-Branding" and a color chart as the best means of selecting the right tip. The Company will be glad to answer any inquiries regarding this new feature.

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For more complete information, consult the annual Wire and Wire Products Directory, Index & Buyers' Guide.

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Norton Co., Worcester, Mass.

ACID INHIBITORS—
American Chemical Paint Co., Ambler, Pa.

AIR DRAW FURNACES—
Carl-Mayer Corp., The, Cleveland, Ohio.

ALKALINE CLEANERS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Rahway, N. J.

ANNEALING POTS AND BOXES—
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

BAKERS—Hi-Speed
Carl-Mayer Corp., The, Cleveland, Ohio.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

BENDERS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

BOBBINS—Braider and Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES & SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

BRICKS—Acid Proof
Keagler Brick Co., Steubenville, Ohio.

CABLE LACQUERING OVENS
Industrial Oven Engr. Co., Cleveland, Ohio.

CABLE—Steel and Copper
Brewer Mfg. Co., Muncy, Pa.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.

CASTINGS—Wire Mill
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.

CEMENTS—Acid Proof
Sauereisen Cement Co., Pittsburgh, Pa.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANERS—Hand and Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANING & PICKLING EQUIPMENT—
Broden Construction Co., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Haveg Corporation, Newark, Del.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CLOTH TESTERS—
Scott, Henry L., Co., Providence, R. I.

CLOTH—Wire, All Metals
Callite Tungsten Corp., Union City, N. J.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Gilron Products Co., Cleveland, Ohio
Standard Industrial Compounds Co., Chicago, Ill.

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

COLD HEADERS—
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Gilron Products Co., Cleveland, Ohio.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CONTROLS—Heat Treating
Niagara Blower Co., Buffalo, N. Y.

CONTROLS—Temperature
Niagara Blower Co., Buffalo, N. Y.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Callite Tungsten Corp., Union City, N. J.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Wks., New York, N. Y.

DIAMOND POWDERS—
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

DIE MAKING MACHINERY — For Forming Special Shapes
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Fort Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Lead Extrusion
Robertson, John, Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies Co., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Fort Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.
Wopis Industry Laboratory, Brooklyn, N. Y.

DRAW BENCHES—
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Stevens Metal Products Co., Niles, O.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

DRYING EQUIPMENT—
Niagara Blower Co., Buffalo, N. Y.
Ross, J. O., Engr. Corp., New York, N. Y.

ENGINEERS—Consulting Wire Mill
Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Humidifying
Niagara Blower Co., Buffalo, N. Y.

EQUIPMENT—Industrial Cooling
Niagara Blower Co., Buffalo, N. Y.

EQUIPMENT—Insulation Testing
Davis, R. L., Electric Co., Wallingford, Conn.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

FURNACES—Annealing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

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FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, O.
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Electric
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Hardening & Tempering
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Robertson, John, Co., Brooklyn, N. Y.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Salt Bath
Electric Furnace Co., Salem, Ohio
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., Worcester, Mass.

HI-SPEED BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

INHIBITORS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

KETTLES—Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Penna.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry & Machine Co., Waterbury, Conn.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Syncro Machine Co., Rahway, N. J.

MACHINERY—Bunching
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Coilers
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
American Insulating Machy. Co., Philadelphia, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Machy. Co., Philadelphia, Pa.
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Moslo Machinery Inc., Cleveland, Ohio.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Porter, H. K., Inc., Everett, Mass.
Robinson Mfg. Co., Muncy, Pa.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Die Making
Firth-Sterling Steel Co., McKeesport, Pa.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.

MACHINERY — Die Making for Forming Special Shapes
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Draw Benches
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Edging
Broden Construction Co., Cleveland, Ohio.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Enameling
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Extruding
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Thropp, Wm. R., & Sons Co., Trenton, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Hydraulic Testing
Riehle Testing Machine Div. of American Machine & Metals, Inc., East Moline, Ill.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John, Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY — Measuring Wire & Cable
Davis, R. L., Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Brockton, Mass.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Nail and Tack
Broden Construction Co., Cleveland, Ohio.
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Quill Winding
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Rubber Strip Covering
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Working, Mills, Calendars, etc.
Thropp, Wm. R., & Sons Co., Trenton, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio
Emory, Robert J., Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Emory, Robert J., Co., Newark, N. J.
Fidelity Machine Co., Philadelphia, Pa.
Marshall Richards Machine Co., Ltd., Gainsborough, England.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Moslo Machinery Co., Cleveland, Ohio
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Swaging
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Riehle Testing Machine Div., of American Machines & Metals, Inc., East Moline, Ill.
Robinson Mfg. Co., Muncy, Pa.
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Size of Wire
Davis, R. L., Electric Co., Wallingford, Conn.

MACHINERY—Testing Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
Shuster, F. B., Co., New Haven, Conn.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Inc., Brockton, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Cable Lacquering
Industrial Oven Engr. Co., Cleveland, Ohio

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Oven Engr. Co., Cleveland, Ohio
Ross, J. O., Engineering Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
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PAPER—Creped Wrapping
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PAPER TESTERS—
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Apex Alkali Products Co., Philadelphia, Pa.

PICKLING TANK LININGS—
Keagler Brick Co., Steubenville, Ohio.
Sauereisen Cement Co., Pittsburgh, Pa.

PIPES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lead Melting
Robertson, John, Co., Brooklyn, N. Y.

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POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.

PRESSES—Hydraulic and Mechanical
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Standard Machinery Co., Providence, R. I. (Mechanical Only)

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Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
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Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

QUENCHING BATH CONTROLS—
Niagara Blower Co., Buffalo, N. Y.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Moslo Machinery Co., Cleveland, Ohio
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

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Norton Co., Worcester, Mass.

ROD BAKERS—
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Moslo Machinery Co., Cleveland, Ohio
Ross, J. O., Engineering Corp., New York, N. Y.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

ROLL STRAIGHTENERS—
Moslo Machinery Co., Cleveland, Ohio

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Brewer Mfg. Co., Muncy, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

STAMPINGS—Steel
Hubbard Spool Co., Chicago, Ill
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRAND—Steel and Copper
Brewer Mfg. Co., Muncy, Pa.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TANK LININGS—Brick
Keagler Brick Co., Steubenville, Ohio.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Haveg Corp., Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TEMPERATURE CONTROLS—
Niagara Blower Co., Buffalo, N. Y.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Riehle Testing Machine Div. of American Machine & Metals, Inc., East Moline, Ill.
Scott, Henry L., Co., Providence, R. I.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power Driven
Standard Machinery Co., Providence, R. I.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Electric
Callite Tungsten Corp., Union, City, N. J.
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled for Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Music
Callite Tungsten Corp., Union City, N. J.
Jersey Steel & Wire Corp., Irvington, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.

WIRE—Non-Ferrous to Specification for Special Purposes
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Stainless Steel
Callite Tungsten Corp., Union City, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.

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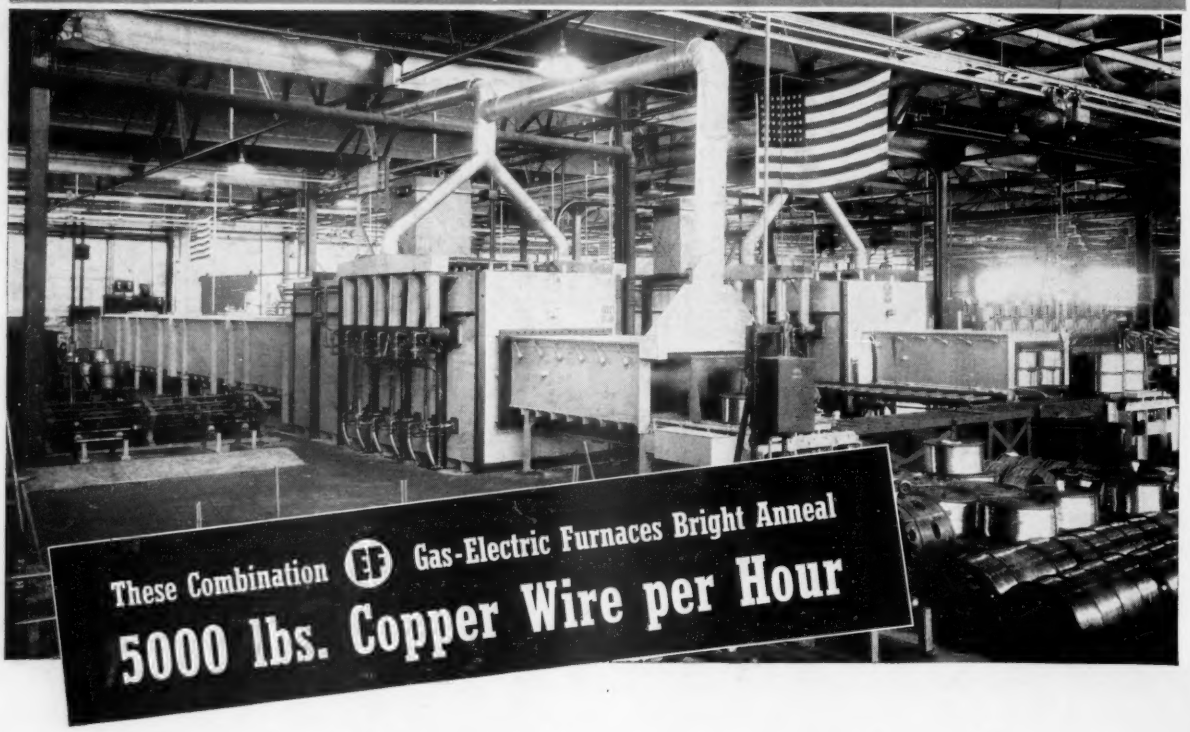

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